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INDUSTRIAL ARTS

Its Interpretation in American Schools

UNITED STATES DEPARTMENT OF THE INTERIOR

OFFICE OF EDUCATION

Bulletin 1937, No. 34

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U.S. Office of education. Committee on industrial arts.

INDUSTRIAL ARTS

Its Interpretation in American Schools

Report of a Committee Appointed by
the Commissioner of Education

MARIS M. PROFFITT, Chairman

BULLETIN 1937, No. 34

UNITED STATES DEPARTMENT OF THE INTERIOR - - - *Harold L. Ickes*, Secretary
OFFICE OF EDUCATION - - - - - - - - - - - *J. W. Studebaker*, Commissioner

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FOREWORD

The primary duty of our public schools is to provide educational training for citizenship in a democracy. Among the important responsibilities of citizenship is that of participation in the work of the community. Every good citizen is a worker and a producer, whether in commerce, professional pursuits, public service, transportation, agriculture, manufacturing, or other occupational fields. He is also an appreciative consumer who is affected by the intricate interdependence of all occupations. Industrial arts, parallel with other subjects and curriculums and correlated with them, contributes to the realization of the goal of enlightened citizenship.

This is essentially an industrial age; modern civilization is dependent largely upon science, invention, and skill. The manufacturing industries are important among the activities which make for the material well-being of the people. They should be exemplified in the facilities provided by public education. The general education of every public-school pupil—his cultural development—is incomplete without concepts, understandings, and appreciations regarding manufacturing and its hosts of workers. Industrial arts as an educational field makes this desired contribution to the pupil's development. It concerns itself with the æsthetic and economic values of materials, with basic processes of manufacture, and with many problems of the workers.

The public schools, through the grades, should be rich in provisions for pupil experiences (1) which teach the necessity and dignity of work; (2) which illustrate the diversification of industry; (3) which provide for testing personal interests and aptitudes in representative crafts; (4) which

serve avocational interests in construction; (5) which develop consumer knowledges and appreciations; (6) which provide occupational training for those who plan to enter employment as industrial workers and for those now in manufacturing trades who desire to improve their proficiency. The first five of these points are served by industrial arts as a phase of the general education desirable for all; the sixth point is the function of industrial or trade education for those who need it as specific training. Industrial arts merges into trade preparation at the time when general education objectives change to specific training objectives.

Educators and public-school administrators in particular have long felt the need for a statement, by persons actively engaged in the work, that interprets the place and function of industrial arts in the educational program. To meet this need there was appointed by the Office of Education, a committee of outstanding persons in this phase of education, a group whose knowledge of educational objectives and educational practices would command the respect of leaders in the fields of school administration and educational philosophy.

The first meeting of the committee, in November 1934, was devoted to discussing the problems involved, to outlining the work to be undertaken, and to appointing subcommittees responsible for the preparation of the first drafts of various sections of the present report. The final meeting was held in June 1936, at which time the drafts of the sectional reports were read and criticized by the committee. In the light of the suggestions and criticisms by the group as a whole, the different chapters were revised and prepared as a unit report of the committee.

Bess Goodykoontz,
Assistant Commissioner of Education.

INTRODUCTION

Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry. The learnings come through the pupil's experiences with tools and materials and through his study of resultant conditions of life. It is a curriculum area rather than a subject or course, being comparable in this respect to the language arts.

Industrial arts, therefore, has general values that apply to all levels, and in a continuous program these values are progressively intensive and are cumulative in their effect as the pupil advances in maturity. Through such a program the pupil:

(1) *Gains knowledge* of the changes made in materials to meet the needs of society, of tools and industrial processes used to effect these changes, of the constant adaptation of materials, tools, and processes to meet changing needs and conditions, and of industrial workers and working conditions.

(2) *Grows in appreciation* of the value of information regarding occupations as a background for a wise choice of a career, of the importance in modern life of tools and industrial processes, of the artistry of the designer and the skill of the artisan, and of the dignity of productive labor.

(3) *Increases in ability* to plan constructive projects, to select and use sources of industrial and related information, to handle tools and materials, to express with material things his individual interests, to use effectively his recreational time, to work and share as a member of the group, and to evaluate work and its products.

(4) *Develops attitudes* of concern for safety practices, of consideration for workers in all fields, of regard for cooperation among the members of a group, and of respect for property.

Largely manipulative in character, yet affording content of an informative, technical, and social kind, industrial arts contributes to complete living because it meets needs that are real and satisfies impulses that are inherent. It contributes in a unique and wholesome way to social awareness and morale. Reading, discussion, observation, and experiment are combined with participation in activities which permit discovery and development of creative and artistic abilities. The articles selected for hand or machine work and the topics chosen for study vary in complexity with the ages, interests, and needs of pupils. The work is appropriate for boys and girls alike, and extends into the realm of adult education. Outside the schools, industrial arts subjects or activities are pursued for avocational and recreational or for occupational values, as individuals or groups may determine. In school and out, regardless of ages and interests, industrial arts makes a unique contribution to intellectual development, to social orientation, and to economic adjustment. Those who would have deep appreciation of its worth to individuals and to society must be students of its origins and compulsions, its universality and permanence, its outlets and satisfactions.

CHAPTER I: ORIGINS AND FUNCTIONS

The general concern of the schools today is to provide a program of education for a society which is fundamentally industrial. The immediate concern here is a program of industrial arts that will contribute to this general goal. The specific purpose of this chapter is to show the origin and development of the present concept of industrial arts as it appears in the programs of public education today. School administrators and others responsible for setting up the programs will, it is believed, be interested in a brief résumé of the origins and in the formation of the attitudes or concepts which affect present-day programs. For purposes of analysis the origins and functions of industrial arts will be presented as four postulates, which are first named and then amplified in the paragraphs which follow.

1. *Individual nature and need.*—As a source of origin for industrial arts it is essential that a study be made of the nature of the individual and of his needs as found in all types of people, from early childhood to old age. These should be studied with particular reference to their range, variety, and characteristics. The application of such an analysis is echoed in the various chapters throughout the bulletin in the discussions of industrial arts in elementary, secondary, and adult education.

2. *Material cultures.*—A study of material cultures of American society in a perspective of great world civilizations will reveal a fundamental origin of industrial arts. For example, man has provided himself since his earliest existence with some kind of artificial illumination ranging from a burning pine knot to indirect illumination by electricity. This origin refers to elements of utility, efficiency, and beauty in things that have been developed and used by man throughout history. This origin more than any other distinguishes industrial arts as a broad subject of study.

3. *Social-economic forces.*—Social-economic forces and conditions which characterize present-day industrial society

and give rise to some of its perplexing problems cannot be neglected in a search for the origins of industrial arts.

4. *Educational thought.*—A study of educational thought, or philosophy, and also history, is essential for discovering the origins of ideas about education in general and of industrial arts education in particular, as these express themselves in gradually evolving school programs.

INDIVIDUAL NATURE AND NEED

Physical activity has provided an all-important means of learning and growth from earliest childhood. Kicking, throwing the arms, and other general muscular movements of early infancy, constituting learning through doing, are the most characteristic activities of the child's neuromuscular system. Such general activities are vital to his development.

As the nervous system matures, activity becomes more specific and purposive. At first it is activity for activity's sake. The baby tosses about, cries, and takes nourishment. Later he runs across the room, with frequent stops and turns for adult approval. A child picks up an article, pulls it apart, or perhaps throws it, regardless of what it is or where he is. This impulse to activity cannot be inhibited without warping growth, but the impulse to activity should be met by materials, incentives, and guidance. Action so controlled results in establishing nervous and muscular coordination essential to proper development. Such a pattern of rational growth continues into adulthood. In childhood the individual begins to assemble objects and to evidence satisfaction when building things out of blocks, or other playthings. By the time he has reached adolescence his muscular and nervous coordinations are developed to the point where without undue strain he can acquire specific physical and mental skills. The span of attention which in childhood is very short gradually lengthens, paralleling physical growth, and accompanying the transition from general to more specific types of behavior.

The individual's tendency to manipulate together with his curiosity concerning what things are and how they operate,

provides a strong motive for learning. There is a natural tendency on the part of every individual through life to manipulate and to investigate material things which concern or interest him and to do things in certain ways or patterns. Industrial arts, as well as the other practical arts, provide a means for self-expression.

The individual, whether in an urban or rural environment, is frequently handicapped by inaccessibility to the things he hears about and wants to experience. It is perfectly natural for a normal child to attempt to satisfy such wants by some means or other. For example, one group of boys assembled equipment for making a printer's outfit in a basement of one youngster's home. Another group built a completely equipped model home, fully lighted with electricity, walls papered, roof shingled, outside painted, and inside furnished. This points with great emphasis to the need for supplying facilities and materials for doing things which children want and need to do, but which should be carried on in educational situations under intelligent social sponsorship.

With increasing maturity and the development of more complex patterns of construction, an ever-wider variety of materials and techniques is required, which if supplied under stimulating influences leads to the development of a scientific attitude of inquiry. The nature of industrial arts makes a universal appeal, not limited by age, sex, race, intelligence, or aptitude. Nor are the values in this phase of education limited to persons pursuing certain occupational interests, for there is no occupational interest but can be served through the broadening influence of an understanding of our industrial life which may be realized through industrial arts experiences. No matter what the occupation, it invariably touches on many material, social, and economic factors. Wholesome stability in these respects may be developed in young people through honest work experiences. The industrialist and businessman, not to mention the parent, are not slow to recognize such truths.

The periods of development, namely, childhood, adolescence, and adulthood, which parallel rather closely the elementary school, the secondary school, and the colleges, or

later programs, respectively, have their special characteristics which find counterparts in varying phases of industrial arts work. Activities, such as industrial arts presents, provide opportunities for self-expression in natural kinds of media as opposed to the kinds used in instruction in abstract subjects. Industrial arts activities provide most excellent educational experiences for preserving and developing the artistic and natural sides of the child's nature.

Orientation as regards occupational life, especially for certain pupils, should be provided in early adolescence, perhaps more prominently than in earlier or later years. The need, however, varies with individuals and with conditions. Once a good introduction has been had to materials and processes, there is an opportunity in later adolescence for realizing values peculiar to industrial arts. An individual's interest in interior decoration, art pottery, fine printing, landscape architecture, or invention, suggests what may be included in an industrial arts program. The implications for occupational specialization or vocational education become at once apparent. More important, however, is the opportunity for exploratory experiences that have value for determining in what broad fields of human activities his interests lie.

The adult work takes many interesting forms, and because of the richness of our industrial society, always provides something of interest regardless of occupation, sex, or maturity. The type of community center to meet the needs of the mature group has scarcely been devised. At this period in life intensity of purpose has increased as has also the capacity for work and accomplishment, both of which are accompanied by growth in social maturity. As society becomes more complex, industrial arts and general work experiences will need to be increased if the individual is to be prepared to understand what is going on about him and to participate successfully in the varied occupational life around him. To deny such experiences on elementary, secondary, and higher school levels in an industrial society is to dwarf the development of the individual and to thwart what now appears to be his birthright—opportunity for ad-

justment to the environment in which he lives. Learning through interaction with environment on ever-widening circles and through ever farther reaching endeavor should be prominent as a basis of learning in this "origin."

MATERIAL CULTURES

As man advances in an involved technology, he should have educational experiences that will enable him to enjoy a finer culture as regards materials than was possible in any previous period of history. This can be realized only if he is broadly prepared to develop and to use his material inheritance. The individual who has learned to know style or design in buildings, rugs, pottery, silverware, glass, furniture, dress, china, and other similar things in common use, is prepared to make selections that an integrated or cultured taste tells him can supply life-long satisfactions. One who knows the various forces—racial, individual, symbolic, material, and national—that have entered into the making of articles of every-day use, is thereby stimulated to a fuller enjoyment of those things than the person without such knowledge.

Individuals in all walks of life respond to the fine contributions of others, particularly those expressed in materials, and by such contributions are people known. For example, the Javanese are known for their batiks; the Chinese for their cloisonne, embroideries, carvings, and thick pile rugs; the Mayans for their clever and meticulous craftsmanship expressed in such forms as basketry and articles of jade and gold; the Japanese for their ceremonial swords, Satsuma, and colored block prints; the Greeks for their classical architecture; the Bokharans for their Turkoman rugs; and the Americans, among other things, for their great industries, skyscrapers, and transportation facilities, all resulting from the development of machines and power.

The question of the universality of a particular cultural pattern always arises in the analysis of a civilization. A middle-western businessman, for example, recently installed $2,000 worth of equipment in the kitchen of his 8-room home.

This contrasts sharply, of course, with the facilities of a poor cotton tenant's home in the South where the only heat and light come from a fireplace. Public education, especially through industrial arts, tends to create a desire for a higher standard of living than the minimum so often encountered.

The American ideal of material cultures seems to call for comfort, efficiency, and beauty. The individual is intrigued by the many possibilities, but it is amazing sometimes to discover how foolishly abstract he can be in planning for the education of his children. Some one has been stimulated to coin the expression *consumer literacy* to indicate intelligence necessary for efficiency in the selection, care, and use of industrial products and services. For example, as you read these lines, ask yourself about the nature of the format and the quality of the paper used in this publication. What style characterizes the chair in which you are seated? If it is Jacobean, is the example a good one? Were you conscious of the character of the articles you handled at dinner last evening? Was the design of the silverware an example of really fine craftsmanship, or a copy, or just a knife and fork? Were the items of the dinnerware products of the great American ceramic industry? Were the cups translucent or just opaque? Was the decoration anything more than a transfer? Study the arrangement of the articles in the room around you. What objective proof have you that good taste is evidenced? Do you and the members of your family know how to choose and use an automobile that will give you a maximum of satisfaction for the money expended? Ability to answer questions of this type concerning culture applied to the use of materials on every hand, is well referred to as *consumer literacy*. Industrial arts is very much concerned with such questions as the above.

Modern man is surrounded by an ever-increasing variety of material things. These include plastics, metals, woods, ceramics, foods, and textiles, in addition to hundreds of variations. The inventory of items found in homes of today is greater than at any previous period of history. All of this seems to point to a much-neglected phase of education, a phase which concerns things everyone uses and should enjoy to the fullest extent. Education in the arts and industries,

for every one, will make a more significant contribution than formerly if attention is directed to the understanding and mastery of our material environment.

SOCIAL-ECONOMIC FORCES

The person of a generation or two ago in rural New England witnessed economic and living conditions little different from those of an Italian community in the time of the Roman Empire, more than a thousand years before. Both communities used hand tools and practiced the household industries; power driven machinery was unknown. Except for a few canals, the only means of transportation was by animal power, oxen or horses. Transportation costs were such that trade was mainly local and in hand-made products. The entire economic system was open to view and free from mystery. The difference between those conditions and the complexities of modern business and industry accounts for many of the problems of maladjustment and misunderstanding that now agitate society. The elements and the principles of social and economic life are the same today as then, but the relations existing between them have become obscured by their very complexity. Points such as these indicate a phase of life which industrial arts and its related social and physical sciences need to interpret. Experiences provided through industrial arts are important for a sound understanding, on the part of the pupil, of the social-economic forces and conditions operating in society.

The school of today needs to interpret the ever-increasing number of significant changes which press for consideration on every hand. The school shop, for example, can no longer justify its program if youngsters only make traditional objects out of wood and then take them home as they did a generation ago. Functions of the modern program require a much more significant contribution. Such programs now provide for:

1. Activities in as many industries as school shops and laboratories will permit.
2. Use of typical and important industrial tools.
3. Experience in production methods.
4. Experience in handicrafts.

5. Acquaintance with the organization and operation of industrial and commercial enterprises.
6. Study of safe and hygienic ways of doing all types of work.
7. Practice in identifying the more important methods employed by industry.
8. Selection and use of some of the common products of industry.
9. Utilization of salvaged materials or products for project work.
10. Interpretation of the sources, principles, and applications of power, such as steam, water, internal combustion, and electricity.
11. Study of the origins and effects of significant inventions.
12. Study of materials from source to completed object.
13. Study of vocational opportunities, living conditions, remuneration of workers, controversial questions pertaining to capital, labor, and technology.

All of these provide not only objective bases for developing industrial arts programs but also criteria for judging their functions.

Since "manual training" was introduced into the program of the American public schools in the early eighties, the social-economic character as well as many of the details of American society have been changed radically because of certain significant inventions and mechanical and electrical improvements. Some of these are: The telephone, the phonograph, the tungsten-filament lamp, the electric railroad, the central power station, the motion-picture camera and projector, the steam turbine, the high-speed gasoline engine, the linotype and monotype in printing, the Diesel engine motor, the X-ray, high-speed tool steel and steel alloys, the airplane, the radiotelephone, the vacuum tube, television, and radio broadcasting.

It is important to recognize that the industrial arts program of today concerns itself with and draws its subject matter from such sources. Manipulation, though very important, is but a means and can be only one part of the whole program. A parallel of this is seen in the chemistry laboratory. A study of the social-economic character of the present day is necessary, a study which will enable the pupil to gain certain abilities, knowledges, appreciations, and attitudes that have become really vital to modern life.

More of this type of education is now possible, as the age at which pupils leave school is increasing, with a decided tendency for pupils to remain in school until 18, or until the completion of high school. Approximately 65 percent of the persons of high-school age are enrolled in high school. This average for the United States as a whole probably means that in a number of States the percentage is as high as 70. This provides essential time and maturity for studying many more significant developments in an industrial society than was possible a generation ago. Some curriculums now include such new topics as air-conditioning, sound-absorption, safety in driving, prefabricated housing, design and craftsmanship in many materials, lighting, applications of modern procedures of business and industrial organization, and a study of occupational opportunities and trends. A reinterpretation of the school's program is called for if education is to meet these all too obvious social and economic needs.

The situation is rendered difficult by the problems resulting in increased leisure. More than 20 years ago Dewey wrote that "the ability to produce and enjoy the arts, the capacity for recreation, and the significant utilization of leisure, are more important elements than those conventionally associated with education and citizenship."

An industrial society is characterized by change, not only technological and occupational, but also social. Its very nature provides industrial arts with an amazing subject matter which more than belies the overly specialized and poorly equipped programs often found in our schools. But the problem is so great that even in an ideal situation the industrial arts laboratory can serve only as a center from which should be directed many valuable field studies and experiences throughout all levels of the school program.

EDUCATIONAL THOUGHT

Many writers on industrial arts refer to educational thought and philosophy as far back as the Renaissance, but documentary evidence concerning "practical" as "useful"

education dates back more than 2,000 years before the birth of Christ. The stone tablets recently excavated at Ur in Chaldea reveal the laws under which young people learned how to do things. The Code of Hammurabi provides another example of early practices. Such laws were perfectly natural because the idea of "industry" or work is as old as civilization itself. While the industrial arts program provides an effective background for later vocational education, it may and should be even more significant in education for living. This is borne out not only by the four origins which have been tested, but all through the history of realism in education.

During the early part of the nineteenth century, while Pestalozzi was establishing his "object method" of teaching, a great industrial revolution was going on in Europe. The general need for more mechanical and scientific knowledge on the part of all potential workers caused great movements in this direction to flourish under philanthropic leadership. These were known as "mechanics institutes" and as "industrial lyceums." They were especially prevalent in England and America. Manual labor schools were common in the eastern part of the United States 100 years ago. Schools for orphans were established simultaneously with industrial reform schools. In all of these newer movements of education, the idea of manipulative work was introduced, not only for its economic usefulness but for its many other values as well. The desire for scientific and industrial supremacy in France and England during the nineteenth century caused these countries to establish many technical schools.

As various countries gradually became aware of the general public need for technical information and training they introduced such work as a part of general education. Home craft (Hus Sloyd) work had long been the vogue in Sweden, with splendid outcomes so evident today in the many pieces of superior craftsmanship from that country. It was natural in the Centennial Exposition at Philadelphia in 1876 that Della Vos, of Russia, should excite the interest of American school people with his exhibit of objects or exercises made in the Imperial Technical School of Moscow.

Dewey nearly 40 years ago stressed the fact that people learn through doing, or activity. In this he but echoed the voices of Plato, Rousseau, Pestalozzi, and Froebel. In his *School and Society* (1899) he wrote that "We must conceive of work in wood and metal, of weaving, sewing, and cooking, as *methods of life;* not as distinct studies, * * * but as instruments through which the school itself shall be made a genuine form of active community life." In another paragraph he says:

> In educational terms, this means that these occupations in the school shall not be mere practical devices or modes of routine employment, the gaining of better technical skill as cooks, seamstresses, or carpenters, but active centers of insight into natural materials and processes, points of departure whence children shall be led out into a realization of the historical development of man.

Historically, industrial arts in public education has had its greatest development thus far on secondary school levels. Here it has passed through two somewhat well-defined periods of professional growth and is now in the midst of a third. The first was named "manual training" by Runkle in 1877, and the emphasis was on *hand* skill, chiefly in woodworking. Exercises in wood and metal, patterned after the Russian plan, prevailed, and the program reverted generally to "keeping youngsters busy" on something which could be displayed at the end of the year and then taken home or thrown away. Wood is a stubborn material in the hands of adolescents, and as most of the work was done by hand, the results were not very satisfactory until other measures and motives were adopted. The controlling, though false, assumption seemed to be that the few skills mastered would have direct vocational bearing. The American need was different from that implied for Russia.

The second period of development was named "manual arts" by Bennett in 1894. While the emphasis was still on skill, the philosophy was extended to include the making of both *useful* and *well-designed* articles, still principally by hand. The introduction of Sloyd work from Sweden during 1888 in Boston by Larsson had a distinct influence on American practice. Following this, considerable work was developed in the schools in arts and crafts. This, of course, was

wholesome, but all the time there was something going on in American life that was being missed by school programs, namely, the phenomenon of industry itself.

The influence of industry brought about a third period of development, which was referred to by Richards, Russell, and Bonser, and others, as "industrial arts" (1906–10). The feeling was that all of the old that was good should be retained but that certain new concepts should dominate. One of the first ideas along with the origin of the junior high school in the second decade of the present century was to provide for broad orientation or exploration. Industrial arts began to call for a diversity rather than a specialization of skills. Many materials were used along with experiences in the basic techniques employed by industry. Bonser's early definition, "Industrial arts is a study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes," was but a modern interpretation of the aims of general education.

CONCLUSIONS CONCERNING THE PROGRAM

The subject matter and experience of industrial arts are derived from the type of society in which people now find themselves. Materials and techniques of production, to say nothing of consumption, are more involved than ever before. This is borne out by the study of origins of industrial arts, which indicates the sources of professional objectives and their use in a functioning program. Curriculum applications are gaged by the resulting criteria. The idea of *exploration*, for example, means not only contacts with a wide variety of tools, materials, and techniques, but a study of occupational opportunities and interests extended even to actual tryouts in industry on the part of advanced adolescents. This principle of orientation has been extended to apply on all maturity levels, from earliest childhood through adolescence to adulthood. It is based upon the ever-present need for finding out about things. The industrial arts teacher is impressed at once by the importance of this objective and should understand well the significance of its

origins. The same is true of the idea of "intelligent consumption"—*selecting*, *testing*, *operating*, *maintaining*, and *judging* products of industry are involved. Such an objective applies from the time one considers a product of industry until it is fully consumed. Considerable significance is seen for the development of this particular objective in industrial arts classes.

The relationship of industrial arts to many other areas of the school and its ability to contribute to these is well known. The nature and media of industrial arts make it particularly well suited as a point of departure to accomplish desirable correlations and even a degree of integration. A chair, for example, has its history, art, arithmetic, botany, English, and even Latin. One thinks of a beautiful ceramic bowl as involving history, art, geology, chemistry, arithmetic, geography, English, as well as glaze decoration, frequently referred to by Italian or French names. Photography involves physics; and printing, which deals with transfers from relief, flush, and etched surfaces, involves certain effects having psychological significances. Most important of all, however, is that from the industrial arts program comes social implications of value both to the consumer and the producer.

The criterion of industry points to certain laboratory procedures which should be adopted in industrial arts classes, particularly on the secondary level. The old individual set of tools is replaced by the tool crib or wall panel. A *personnel* organization directed by the teacher now manages the laboratory of industries. In this organization it is not at all unusual to discover a production foreman, a designing engineer, a merchandising manager, a chief clerk, a safety engineer, a tool-room foreman, and several line foremen operating the school laboratory. No topic having to do either with producers or consumers in an industrial society is excluded from the discussions. This, of course, calls for a psychological rather than a logical or traditional classification of subject matter—units of study rather than jobs are favored. Projects become means rather than ends. It is the rule rather than the exception to develop the program in

conference with the pupils or students involved. Text and reference materials are more widely used because the method of investigation or research becomes one of the most common to be employed. Industrial arts, as a consequence, finds itself becoming increasingly more functional and therefore more useful to the individual concerned.

CHAPTER II: IN THE ELEMENTARY SCHOOL

Need for the study of industrial arts.—The elementary grades constitute the period of foundational education, of training in the common subjects, of beginnings of concepts of industrial processes and interdependence of consumer and producer. Industry and the machine are prominent factors in our civilization, factors which any plan in education must consider. The complexity of modern industry with its constant improvements in methods and materials is difficult for a child to understand without a background of the simple principles and processes underlying it. In times past, a child through actual participation in home activities acquired a knowledge of industrial processes and some appreciation of the value of their products in his life. He had a share in the responsibility and, therefore, he knew the amount of time and labor that was required to produce the things his family needed and the tools and processes by which materials were made more usable. He had a well-rounded industrial education.

Today opportunities for such first-hand knowledge are lacking. The child's experience on the whole is with the finished products—stone already hewn, lumber that has been milled, steel girders assembled for building, clothing bought ready-made at the store or from a mail-order house, foods put up in cans, cartons, or packages. The product is ready for his use on demand. He does not realize the romance, the work, and struggle behind the scenes. He is unaware of the wonders of industrial achievement. He accepts the products he uses with little or no thought. Yet, as an intelligent member of society and as a wise consumer, he must know more than appears on the surface. Industrial arts as a content subject of the curriculum, through giving the child this background, contributes to his understanding of what is going on about him and to his living more intelligently. It is a study of the experiences of people in changing materials into products to meet their needs and the needs

of others, and of the influences of these experiences upon the lives of people.

No differentiation should be made on the elementary level in the opportunities in industrial arts offered to boys and girls. Both are consumers of the products of industry; both have needs for the traits that industrial arts aim to develop. As members of the same classes and social groups they should study their problems together. Each will tend to supplement the other because of their varying abilities and because of the keen interests they will probably take in different aspects of the same study. If the elementary school deals adequately with the problems and challenges of its pupils, it will include for both boys and girls the experiences inherent in industrial arts.

Objectives.—No attempt is made on the elementary school level, grades 1 to 6, to cultivate vocational interests or possibilities. The purposes are, rather:

To help the child understand what is going on about him in the industrial world:
- Materials that are used—their sources and characteristics.
- Products into which they are made and their values (intrinsic, aesthetic, utilitarian).
- Changes that have been made in the materials—the causes, the effects:
  - Struggles and problems of all people who have made the changes from early times.
  - Tools and processes they used.
- Continual progress in industry:
  - Constant search for new materials and methods.
  - Contributions of science to this progress.

To give him many opportunities to express himself concretely in a variety of media, always expecting that there will be a constantly improving technique with maturity and experience.

To open a field of leisure-time activities in which he may find an interest.

To contribute toward his acquiring the habit of thinking a job through:
- Seeing the thing to be done.
- Taking account of the situation, its resources, limitations, and possibilities.
- Trying to foresee and avoid difficulties.
- Making definite but tentative plans before beginning work.

Evaluating the work as it progresses so that as little time, effort, and materials as possible will be wasted because of error.

To further the development of his appreciation of various people in terms of their culture:

The interdependence of peoples in—

Supplying materials.

Making changes.

Sharing new ideas and methods.

Modern industry's use of many of the principles and processes discovered by early people.

The complexity and possibilities of modern machines as compared with primitive tools and devices.

To help him become a wiser consumer and a more intelligent participant in a society that is markedly industrial.

Typical child experiences.—Activities similar to those given below should characterize industrial arts work. In the beginning the activities will be of the simplest type; later they may be more varied and complex.

Raising questions on things that interest or puzzle the children.

Recalling pertinent experiences.

Suggesting things to do or to make.

Making choices.

Gathering information from as many sources as possible:

Listening to someone tell or read.

Reading for one's self.

Studying pictures, models, films, samples, materials.

Taking a trip or making a visit.

Watching a demonstration.

Asking someone who knows.

Experimenting with materials, tools, and processes.

Planning an individual project:

Making a choice.

Considering materials that could be used.

Deciding on the one that is best for the purpose.

Discussing some of the preliminary problems.

Deciding on ways of working:

Exercising care to keep everything clean.

Evaluating the plan.

Working on an individual project:

Discovering new problems while working.

Finding an answer to one's own questions or asking for help on them.

Watching a demonstration or another child's method of work to clarify one's own work.

- Making further plans as needed.
- Evaluating one's own work.
- Deciding whether finished work serves the purpose.
- Suggesting things one will have to keep in mind for future work.

Experimenting with materials, tools, and processes:

- Finding out how they react.
- Learning what causes things to happen:
  - Why clay cracks in drying, wood splits in sawing, a nail refuses to hold, and saw jumps, or a thread breaks in spinning.

Learning the value of the following procedures:

- Analyzing one's own efforts.
- Studying another's methods.
- Taking care of tools.
- Taking care of materials.

Planning work on a class project:

- Sharing ideas and suggestions.
- Discussing relative merits of projects and ideas.
- Selecting the one that has more possibilities for serving class needs or ends.
- Helping to break up the big problem into subdivisions or work to be done:
  - Discussing general ways and means.
  - Listing things to be done.
  - Deciding how to apportion the work.
  - Considering individual interests and abilities.
  - Choosing committees on which to work.

Working as a committee:

- Discussing ways and means.
- Checking available materials, tools, references.
- Bringing in additional supplies, tools, and books that are needed.
- Getting necessary information from books, pictures, trips, friends, and neighborhood workers.
- Conferring with teacher or class as need arises.
- Pooling their findings:
  - Checking with information of others.
  - Deciding on essentials.
  - Allotting individual jobs:
    - Getting additional information.
    - Making an article.
    - Experimenting with materials.
  - Making or adapting articles to serve their needs.
  - Evaluating their work:
    - Testing to see if it meets the need.
    - Getting class suggestions.
    - Improving or correcting when necessary.

Sharing their experiences with others:
Planning and giving a party.
Planning and making a museum or materials, models, samples, articles that have been collected during a study and which others might like to see.
Inviting parents or another class to see the work:
Writing invitations.
Deciding on spokesmen or guides.
Suggesting the points the guides should make.
Planning and giving an assembly program based on work in classroom:
Considering the limitations set up because of—
Time allowances.
Room conditions.
Audience.
Selecting the topics that would be most interesting, worth while, and practical.
Suggesting how they could be worked out.
Writing a play, selecting the music and dances.
Making a book that tells of their experiences.
Writing a report of an experience for a newspaper, class, school, community.

ELEMENTARY INDUSTRIAL ARTS FOR BOYS AND GIRLS

GRADES 1 TO 3

In these grades, the child should have rich experiences with the materials of industry around him and with simple ways of changing them to meet his needs. His interest is centered more or less on his home, school, and neighborhood, where he daily comes in contact with innumerable products of industry that are made from materials easily obtained and easily manipulated—materials with which he can satisfy a need. As his interests broaden, he learns about many people. He finds how various peoples have worked with raw materials and devised ways and means of making them serve their needs for food, clothing, shelter, records, utensils and containers, and tools and machines.

Orientation in materials of industry.—The teacher should provide many experiences that will make the materials in the child's life more meaningful. He should become acquainted with the possibilities of clay, textiles, skins, paper, wood, and foods. As he adapts these materials to meet his needs, problems in subject matter will probably arise. This content might include: The sources of the materials, the objects the

child sees around him that are made from them, the story of the processes carried on in making changes in the materials, and the characteristics of the materials and products learned by working with and using them.

With many children the natural way of beginning may be for the teacher to provide a work period during which the learners, independently, will become acquainted with a few of the manipulative possibilities of various materials and, as needed, with some of the tool techniques. The character of this work will depend upon the previous experiences of the children, on the size of the class, on the teacher, on the materials available, and on the facilities for working.

The work undertaken should be based upon the child's desire to make something for himself or others. Toys, gifts, trips, favorite stories or poems, holidays, and festivals are full of interest for the child and offer many possibilities for experiences with materials. An interest in dolls, for example, may lead to the making of a family of dolls and the things they need. A study stimulated by this interest might be developed in several ways, for example, the class as a whole may use one material only; the pupils may be divided into two groups each working with a different material; or they may work as individuals being encouraged to make a choice of media. In individual experimentation, one child may adapt a box for a room or garage, another may make a wooden bed, a fur coat, or a woolen dress for a doll, a wagon or clay bowl for someone's birthday. The child will find in working that he must consider many things, for example, how the grain should run in the wood for the handle of a wagon, or for a toy animal with legs and a tail; whether cloth or paper should be used for the cover of a record book that will be handled again and again; how the gifts that the children have constructed can be made more attractive. Such points should be so treated that the child will be led to observe how other people have solved these problems, to compare the methods that have been used, and to select the one that best meets his needs. This orientation with materials, processes, and products should help the teacher to discover the child's particular ability, weaknesses that need strengthening, or tendencies that need to be curbed.

Since the very young child is not group minded, it is a part of his learning that he become interested in the needs of the group. As soon as possible, therefore, the teacher should lead the children from their purely individual interests into group interests and activities. Preparation for a party or a puppet show, furnishing a play corner or a library corner provide ample opportunity for group work which is the method of acquiring social habits and attitudes.

Home and neighborhood industries.—As the child's experiences grow and his skills increase, the subject matter should include a study of some of the industrial processes carried on by people in the neighborhood. The study should bring out the products the people make for us; the tools, materials, and processes they use; and the interdependence that exists between the child's family and the other workers.

As new interests develop from ongoing studies, the children will find new problems. They may want a house to live in or one for their dolls; they may need a store in which to buy and sell—a fleet of trucks, a freight train, an airplane to transport the products for the store—they may be going on a picnic or giving a party, preparing for a play or show. Each of these interests is full of opportunities for problem solving, for cooperative enterprises, for manual activities with a variety of materials, and for the acquisition of new understandings and appreciations.

The subject matter which may be developed during these activities may include such points as these:

Ways in which the thing being studied is affecting the life of the learner.
The products:
  Source and manufacture:
    People who help to produce the product.
  Characteristics and varied uses:
    Distribution to the consumers.
    Value and care.
The materials used in the products:
  Sources, limitations, possibilities.
  Processes in securing and preparing them.
Story of man's progress in learning how to make such products.

The beginnings of industries.—As his studies and readings bring out the contrast between his own environment and that of other peoples, and the glamour and adventure of

their lives begin to stimulate his imagination, the child wants to do the things they did. Authors, today, are giving more thought to such interests of the children. Books are full of colorful illustrations and vivid descriptions of the lives and industries of many people, and contain suggestions for work with tools and materials. Some of these books for children relate the story of food gatherers and hunters such as the Eskimo, the Jungle People, the Tropical Island People. Others tell about primitive farmers and herdsmen such as the early Hebrews, various Indian groups, the nomads of the desert, and others. This material is invaluable for the child when he is able to read and search out information for himself.

No matter what study is being planned, the teacher and children should become acquainted with the facilities offered by the neighborhood; the types of work and materials that may be seen; displays in store windows that are pertinent; people who may be willing to bring in articles they have, and tell about them or show them. The children should be led to consider such questions as these: Who in the community can best help us? Are there pictures available? How can the library help us?

The teacher should be familiar with materials that are free for the asking from the Government, the State, the local chamber of commerce, stores, and industries near and far. She will find, however, that certain modifications may be necessary before one can use these illustrative materials. They will need to be submitted to a critical eye. The teacher may well ask herself such questions as these: Can this picture be used as it is? Would certain changes, eliminations, or combinations, make these materials serve a better purpose? Would it not be better to mount these pictures separately so that they can be available for future use? Will this one function better in the approach or in the development or in the summary?

The teacher and children may approach any study in industrial arts by using leads that arise in class—questions the children may ask about things that interest them in and out of school, suggestions they may make while working with other studies in the curriculum, preferences they show, and needs they may have. At other times the teacher may have

to use pictures and other illustrative material or suggest the possibilities in working on a particular topic in order to extend the work they have been doing. The enterprise is, educationally the means toward an end—the growth of the child—and not an end in itself.

Any study, large or small, that contributes to the growth of the child is valuable. The teacher, however, must evaluate the possibilities of each worthwhile lead: How much it can build on the experiences of the children in and out of school? How much opportunity it will offer them for experimentation on their own level with materials and processes, and for solving their own problems? What leads it may offer for new studies? What changes the study may make in the children's living and thinking?

If on the basis of such questions the teacher feels that certain enterprises are worth while, she and the children are ready to make their decision and will proceed to study their problems and to find ways and means of meeting them.

The following outlines suggested the type of content that may develop during the study of the industrial arts of any people. The outlines imply types of manipulative activities in which the children may engage and points of departure for work in other subject fields.

Study of food:
- Kinds of food eaten:
  - Sources of the food:
    - Causes and effects of abundance or lack of food.
    - Proximity of home to food supply:
      - Ways of travel to reach distant foods.
      - Methods used in bringing the foods home.
    - Advantages of having stores and markets in one's neighborhood.
    - Methods used in securing food:
      - Weapons, tools, and containers used:
        - Ways of making them.
        - Reasons for selection of materials.
        - Ways of using them.
      - Work of the men, women, and children.

Preparation of foods:
- Processes:
  - How the processes compare with those which the child sees in his own environment.
  - How the method of making fire compares with striking a match or the use of a pilot burner.

- Tools and containers:
  - Ways of making and using them.
  - Methods of decorating them.
- Work of the men, women, and children.
- Manners and customs relative to food:
  - Meal time among the people.
  - Our meal time.

Preservation of foods:
- Methods used—compared with our methods.
- Reasons for preservation.
- Foods we eat that have been preserved.

Dances, festivals, games that are related to food activities of the people.

Study of clothing:
- The dress of the people—men, women, and children:
  - Garments, footwear, head coverings, and ornaments:
    - Similar articles of clothing we wear.
- Processes used in making clothing:
  - Materials used in them:
    - Sources of the materials.
    - Tools used in obtaining them.
  - Methods of preparing the materials:
    - Tools used:
      - Materials used in making tools.
      - Work of the tools.
  - Making the clothing:
    - Ways of fashioning the garments:
      - Tools used.
    - Fasteners used:
      - Materials of which made.
      - Preparation of the fasteners.
    - Conditions under which clothing is made—compared with our conditions.
- Decorations and accessories:
  - Means of decoration.
  - Materials and methods used.
  - Meaning of symbols used in decoration.
  - Similar designs or symbols used in decoration of clothing in class.
- Work of the men, women, and children in providing clothing.
- Relation of clothing and costume to natural environmental conditions.
- Care of clothing:
  - Repair.
  - Cleanliness.

Study of shelter:
- Kinds of shelter used:
  - Reasons for each type.
  - Reason for location.

Reasons children's parents had for selecting their house.
Adaptation to environment.
Adherence to mores and custom.
Ways of building:
Materials used, reasons:
Buildings in the neighborhood made of similar materials.
Preparation of materials.
Adaptation of materials to the need.
Tools used:
Kinds.
Materials in them.
Methods of using them.
Work of the men, women, and children.
Interior of the home:
Arrangement.
Furnishings.
Provisions for heat, light, and water.
Activities in or near the home:
Work of the family.
Feasts.
Dances and games.
Story-telling.
Care of home:
Sanitation.
Aesthetic factors.

GRADES 4 TO 6

With its emphasis upon the children's own problems and their interest in common materials, simple processes, and types of industries found in their immediate environment and among various peoples, the work in the first three grades lays the foundation for further industrial arts studies. Work on the higher level—grades 4 to 6—should help the child to understand something about how and why our machine age has developed, how interdependence has grown with industry, how changes are still being made, and how, despite the changes, many of the processes and principles used in industry today are the same as those discovered and used by early people.

Industry prior to the industrial revolution.—The home and community industries of colonial people offer excellent material for study, material that will help to explain the complexities of our industries today. The colonists not only

came in contact with a primitive people, but at first had to live under rather primitive conditions themselves. As time passed, household industries increased and the family, the itinerant workers, and those in local shops and mills met practically all the needs of the community. This period offers a clear picture of industry prior to the industrial revolution, industry as a colonial boy or girl knew it.

Textbooks, histories, readers, and story books offer all sorts of graphic descriptions and narrations that make this period real to the child. At present the children's books deal primarily with the life of the New England colonists. Since printed material for other colonists is somewhat difficult to obtain, the children's research will often be based on these books. But, whenever possible, the teacher should contrast the industries of New England with those of other regions having home industries. Study material may be found in colonial exhibits and in museums or in art, literature, or music which reflect the life of the colonial period. Grandmother may have a flax wheel; a second-hand shop may lend a wool wheel or candle mold.

Through the use of such materials as these, the child begins to visualize the experiences of a colonial child. What can he do to understand even better the life in colonial times? He can make maple sugar and have some of the fun a colonial child had: Dip a candle and see how careful one must be so that the wax will adhere to the wick; pour some candles and see the improvement in method; spin a thread and sense the skill and rhythm that are necessary; listen to a record of a spinning song that shows a musician's interpretation of the wheel; watch a visitor spin on a flax or a wool wheel, try it himself; weave on a harness loom; work in metal and wood. In doing things like these and in studying the related content that may be developed with them, the child acquires some knowledge of the way in which the colonists lived and worked, of the materials they used, and of the ways in which these were changed to meet their needs. He gains an appreciation of the ease and comforts he has in comparison with the difficulties and discomforts a colonial child experienced. The content of such a study may include the following points:

Industries within the home:
- Cooking, baking, and preserving of foods:
  - Foods the colonists knew and brought from the old country and new foods they learned to use.
  - Recipes they used which we still use.
  - The fireplace with its array of iron, copper, and pewter utensils:
    - Modern fireplace—its function.
  - Utensils made in the home or imported from England.
  - Manners and customs in serving and eating food:
    - Comparison between colonial implements, containers, and furnishings, and those we use today.
  - The work of boys and girls, men and women:
    - Providing food.
    - Making maple sugar, cheese, butter, bread.
    - Making the necessary utensils and containers.

Preparing and making cloth, clothing, and furnishings:
- Preparing fibers for spinning:
  - Steps (vary with fiber).
  - Differences between flax fibers and those of wool or cotton.
  - Tools used.
  - Uses of waste materials.
- Spinning the fibers:
  - Steps—pulling, twisting, winding.
  - Flax wheels vs. wool wheels:
    - Differences in size and use.
    - Advantages over spindles used by primitive peoples.
  - Reels for winding the yarn.
- Weaving cloth:
  - Steps—making a shed, picking, beating the filling threads into place, winding cloth.
  - Harness loom:
    - Purposes of harnesses, cloth and warp beams; advantages of harness loom over looms used by primitive people.
  - Meaning of "homespun" cloth.
  - Reasons for variety and quantity of textiles we have today.
- Making dyes and coloring materials:
  - Sources of the dyes.
  - Methods used in dyeing yarns, cloth, rags:
    - Home dyeing today.
- Making clothing and furnishings:
  - Sewing garments:
    - Variations in costume.
  - Making samplers, quilts.
  - Braiding or hooking rugs—strips made from worn-out clothing.

- Work of boys and girls, men and women.
- Providing light:
  - Securing "candlewood" or pitch pine for torches to be placed near fireplace.
  - Making candles:
    - Difficulties in collecting sufficient materials.
    - Methods used.
    - Advantages of molding over dipping:
      - Itinerant candlemaker.
    - Candle holders:
      - Variety.
      - Materials used.
  - Comparing candles with modern lighting facilities.
- Making chests and other pieces of furniture:
  - Kinds of wood used, sources.
  - Tools the worker had:
    - How these compare with primitive tools and with those we use.
  - Types of furniture made:
    - Importance of chest.
    - Decorations used.
  - Fastenings used:
    - Making pegs, hinges, nails:
      - Advantages of modern machine production.
  - Colonial reproductions used today, why.
- Making soap.
  - Securing materials:
    - Collecting fat.
    - Making lye.
  - Methods of making soap—then and now.
  - Comparison with soaps we use—color, perfume, purpose.
- Industries in the community:
  - In the shop adjacent to the home, in mills along streams:
    - Baking.
    - Cabinet making.
    - Printing, type casting, and binding.
    - Shoe making.
    - Working in metal—iron, pewter, silver.
    - Grinding meal and flour.
    - Paper making.
    - Wood turning.
    - Making buckskin and tanning leather.
    - Ship building.
    - Making bricks and pottery.
- Industries similar to colonial ones that may be found today in the community.
  - Differences between colonial and modern workers, methods, products.

The study may center about the life of colonial boys and girls—the work they did, the things they saw, their school life, and their home life. It should bring out similarities and contrasts between their life and the child's life now. How rich the study can be made will depend to a large degree on the facilities of the school and neighborhood and the materials that are available. Some industries may be studied in detail; others may only be mentioned. The study may be summarized by a colonial play, a fair or market, or an exhibition of colonial articles lent by parents, friends, and children, or made by the class. The children will not only work with tools and materials and learn some of the processes in industry, but will come to realize through this colonial study that the simple hand-made machines run by man, animal, wind, or water power could not continue to supply the demands of a growing nation.

Modern industries.—The demands for more products, more comforts, and more luxuries led to inventions in machinery that would offset the scarcity of labor and yet speed up production. The relation that exists between industry today and in earlier times, the effects of inventions and scientific discoveries upon industry, the resulting influence on the lives of the people furnish the child with significant materials for a study of modern industry.

What resources are available for the child in this study? Industry itself can offer many thought-provoking problems, can answer questions that are puzzling him, open up new interests, and broaden his knowledge and understanding. Almost every community has facilities that can be used for first-hand experience—a dye house or a textile mill, a canning factory or a meat-packing establishment, a newspaper plant or a publishing house, a paper mill, a bindery, a saw works, or a toy or furniture factory, any one of which is rich in interest for the child. The museums display furniture, rugs, costumes, books, pottery, glassware, and implements that illustrate various stages in man's achievement. Writers of children's books are beginning to sense the romance in industry's development and are describing in vivid detail the cause and effect of each stride forward.

The child at this level should begin to understand the gradual progress industry has made from times past, the contributions of various peoples to industry of today, and the materials and methods people have used that served their needs but were supplanted as something better was discovered or invented. He will begin to know something of the characteristics of modern industry; its dependence on all parts of the world for raw materials and for markets for its products; its continual investigation and research for new materials and new methods; its contributions to us in added comfort, ease in doing things, and increased time for leisure.

There are a number of areas of human endeavor which the children may profitably explore in gaining a better understanding of what industry has contributed to life. In the industrial arts field these areas are concerned with how man has provided himself with such things as pottery, clothing, building materials, the book, power, food, paper, and furniture. The study of these may be helpful in understanding race progress. Exploring them will call for pupil experiences in industrial processes and may make use of skills and knowledges acquired in other subjects. It will call for experimentation, construction, and much use of library facilities. Of all these studies, some teachers have found that the book offers the most appeal for the child. He uses books constantly in school and at home. He goes to the library to select the books he wants. He buys some of his own books. He must know how to care for these. Questions of print, binding, illustration, and serviceability may come to be significant to him. A study of books, their manufacture and their development, and the actual construction of some bound books should help to solve many of the problems he faces as a consumer. The following activities may be carried on by the children in such a study:

Pooling their knowledge of books.
Deciding on some of the things they wish to know about books:
    Listing the suggestions, weighing them, grouping them under headings.
Discussing ways of attacking the problems.
Planning specific methods of work:
    Research, reading, construction, experimentation, trips.
    Individual and group responsibilities.
Setting up standards of work.

Bringing in reference books, illustrative materials to supplement those in school:
    Sharing the findings from various books and other sources.
Finding out what materials various peoples used in record keeping.
Gathering materials similar to those used in other days.
Experimenting with materials used in record keeping:
    Forming tablets of clay or wax and writing on them.
    Making scrolls from papyrus.
    Curing skin for parchment.
    Making brush, stylus, pen.
    Mixing ink.
    Casting type.
    Making paper pulp from rags.
Comparing their products with similar museum or commercial articles.
Studying about the people who used these articles:
    Environment, manners, customs, writing, and record keeping.
Collecting pictures that show important contributions to the development of records:
    Evaluating individual pictures.
    Selecting those that are most suitable.
    Arranging them artistically to tell the story clearly.
    Labeling the collection.
Planning a visit to a library, a bookshop, an industrial plant, a museum; visiting; reporting and discussing findings.
Making models that illustrate stages in book development.
Analyzing the construction of books to discover what they know, problems that are new.
Making books (similar to commercial ones) to be used for—
    Individual records of experiences and things learned in "The Study of Books."
    Collections of stamps, photographs, addresses, recipes.
    Class poems, class records, notes.
Illuminating and hand lettering a text such as a holiday greeting.
Planning, etching, and printing a book plate.
Constructing book ends or book racks to meet individual requirements.
Studying slides or films of newspaper or book making.
Listening to an illustrated talk by a visitor interested in books or printing.
Experimenting with the making of printing plates:
    Stereotype:
        Making a mat or using an old newspaper matrix.
        Fitting matrix into flat box or curved casting box (homemade).
        Pouring in melted wax or lead.
        Printing from the plate.
        Comparing print with proof from commercial plate.

Electrotype:
Examining commercial wax molds, shells, plates.
Watching a demonstration of electrolysis—copper being deposited on wax mold coated with graphite.
Comparing the deposit with commercial "shell."
Printing from an electrotype.
Making a collection of old books and printed materials found in the community:
Examining old books.
Repairing and caring for books.
Planning and giving an assembly program to share experiences with others:
Discussing relative merits of suggestions.
Deciding what is possible, considering the:
Time that is available.
Room conditions.
Stage properties required.

As the children follow their individual interests in this study—gathering pertinent information; making a needed article of wood, clay, skin, paper, metal; experimenting with tools and processes—and bring their findings to bear upon the class problems, much of the following content will probably be developed:

Books we use today:
Diversity of content.
Attractiveness of form.
Illustrations.
Legibility.
Durability.
Value to us.
Vast numbers produced.
Modest cost.
Libraries:
Public, private, school:
How to use the library:
The card index.
Classification of books by numbers.
How libraries came to be—
Kind of books they contained in times past—in Egypt, Babylonia, Greece, Rome.
Materials available in these lands.
Tools that were used in writing by—
School boy.
Scribes.
Advantages and disadvantages of the various materials compared with paper.

- Home:
  - Interesting books for a child to own.
  - Use of bookcases, book racks, book ends, bookmark, and bookplates.
- Publishing houses that supply us with books:
  - Editor's and author's manuscript.
  - Printers and the manuscript:
    - Setting up the pages:
      - Linotype and monotype machines.
      - Electrotypes.
      - Workers.
    - Printing the pages:
      - Presses used:
        - Speed.
        - Pages printed at a time.
      - Work of the pressman.
    - Folding the pages:
      - Machines and workers.
  - Illustrations and the artist, the photographer and engraver:
    - Photographing the illustration on sensitized film or plate.
    - Preparing the printing plate:
      - Etching.
    - Halftone.
  - Illustrations in color and the pressman:
    - Color printing:
      - Making colored inks.
  - The printed pages and the bookbinders:
    - Collating, sewing, and preparing pages for the covers:
      - Machines used.
    - Making the cover:
      - Materials and machines used.
    - Finishing the book.
- History of the book:
  - Development of modern book form from flat sheets and scrolls.
  - Handwritten books in the Middle Ages:
    - The work of the monks and their influence:
      - Tools and materials they used:
        - Sources and method.
  - Early printed books—about the time of Columbus:
    - Invention of movable type by Gutenberg:
      - Education among the people at that time:
        - Block books, tracts.
      - Difficulties of printing from carved blocks of wood.
      - Advantages of single letters as units:
        - Style of letters used.
      - Method of molding or casting the letters.
    - The materials used in the covers, their decoration:
      - Preparation of leather.

- The printing of the book:
  - Methods:
    - Casting the type.
    - Setting up or composing the text.
    - Printing two pages at a time from:
      - Type—text.
      - Carved wooden blocks or engraved plates—illustrations.
  - Workers—their training, costumes.
  - Time required.
- The binding of the book:
  - Method.
  - Workers.
- Influence of spread of knowledge and of demand on books and printing:
  - Invention of better presses:
    - Sturdier, faster platen presses of iron.
    - Newer presses—cylinder, rotary.
  - Invention of automatic type-casting machine to replace hand casting.
  - Invention of machine that not only casts type but sets it up like the copy.
  - Experimentation with new materials in paper making and bindings.
  - Use of the mold idea in making printing plates to duplicate printing matter.
  - Use of photography in making printing plates for pictures and illustrations.
  - Inventions of machines for making covers of books and for binding after printing press has done its work.
  - Specialization of modern workers.
- Care of books:
  - Value of clean hands.
  - Best ways of:
    - Opening new books.
    - Holding books.
    - Marking one's place in book.
    - Removing book from shelf.
  - Care of books when not in use:
    - Putting away properly.
    - Dusting.
  - Simple repairing.

ORGANIZATION AND ADMINISTRATION OF ELEMENTARY INDUSTRIAL ARTS

CLASSROOM TEACHER AND EQUIPMENT

Grades 1 to 3.—In these grades industrial arts can readily be taught by the classroom teacher—the content is simple,

the skills are few, the necessary equipment is limited. One set of tools for each classroom is desirable but, if necessary, one set may suffice for several classes if the various classes can cooperate in the use of them. Experience will show how many of each tool will be required to meet specific conditions but the set should include compass, coping, and hack saws, hammers, braces and bits, try-squares, and small clamps. The best tools manufactured should be used for this purpose and should always be kept in repair. The upkeep is small and the original cost, spread over a period of years, is not large. If conditions warrant, it is an excellent plan to have each classroom equipped with such facilities as the following: Running water, a 1-plate burner, ample storage, a limited number of tools, a work bench or table provided with one or more vises, a hinged shelf along the wall for additional work space, a display panel, and an enclosed case for illustrative materials.

Grades 4 to 6.—Classrooms in these grades should be equipped in a fashion similar to that suggested for the first three grades. This will permit simple experimentation and activities to be carried on in the classroom. As phases of on-going enterprises become more complex and require more varied use of tools and supplies or a broader knowledge of content and a more specific skill with tools than the grade teacher possesses, the children should be able to call on a specialized teacher for help.

SPECIALIST TEACHER AND LABORATORY

This teacher should be a man or woman who has majored in the field. He should have a shop or laboratory that is equipped for individual and group work. This necessitates flexibility in equipment, in supplies, and in reference books to care for the needs of the various groups at work—at one time, a group of 7-year-olds may bring their problems to him; at another, it may be several groups of 11-year-olds. This shop can afford many opportunities for experimentation and can be a rich source of help with its collection of samples, illustrative materials, and books. The room should be provided with running water, a range, plenty of

storage space, ample display panels, bulletin boards, and blackboards. There should be work benches and tables, tools, and other equipment for working with a variety of materials. The time of the specialist and the use of the laboratory should be adjusted to the conditions and needs of each school.

The specialist should work with the classroom teachers in planning for the children's needs. His broad background of industrial information and his specific skills will supplement the classroom teacher's specific knowledge of the children and of their work. Industrial arts studies may be carried on by the regular teacher in her classroom or by this teacher and the specialist working together with the children in the classroom or in the shop as the need arises.

In many of our school systems the boys of grades 5 and 6 have been going to a shop for special training in industrial arts while the girls are having sewing. Time and thought will be needed to adapt this set-up to meet the suggestions which this discussion proposes.

TRAINING OF TEACHERS

How much a child will grow through his experiences in industrial arts at any one level will depend on the teacher's ability to sense and to give him the kind of help and direction he needs as an individual. The teacher must know what experiences the child has had and what learnings he has acquired, and should teach him to use these in interpreting new situations and in solving new problems. The teacher must realize the possibilities for problem solving that are inherent in industrial arts activities, activities that are motivated by keen interest on the part of the child. He must seize the child's interest at the right moment and make it function in building desirable attitudes, habits, and skills. He must be sufficiently versatile in industrial arts skills to help the learner acquire standards of work in many manipulative activities. He must be broad in his interests and knowledge. The teacher must interpret values in terms of child living and must know how such values develop; he must realize the part each activity may play in furthering child growth.

Many communities may lack classroom teachers trained in industrial arts. This need can be met in several ways. Teachers already in service who have no industrial arts background can perhaps be trained locally to do the work. Courses in industrial arts and special help can be given them to meet their specific needs. Prospective teachers can be prepared in teacher-training schools, many of which include industrial arts as part of their curriculum, offering required courses in industrial arts for all students and elective courses in addition for those who wish to specialize in the field. The specialist should, in addition to specializing in industrial arts, meet the requirements for teaching in the elementary field. As in the grades, the specialized teacher may be man or woman, the criterion being a live interest, a pleasing personality, a cooperative attitude, and an ability to teach.

CONSULTANT OR SUPERVISOR

In some communities, an industrial arts supervisor may fit into the educational scheme. This man or woman, working with the principal, teachers, and children, should be responsible for improving the teaching of industrial arts. As a consultant and leader of teachers he should assist them in making tentative plans. It is his responsibility to keep in mind the total work of the children and to hold it in relationship to their interests, capacities, experiences, and environing conditions. Whenever necessary he should take a series of lessons with the children in order to demonstrate to the teacher a method or procedure that has been under discussion. He should be responsible for knowing and acquainting the teachers with trends in the field, reference books, illustrative materials, samples, new types of materials. He should be able to lead the teachers to share their experiences and to make suggestions in the development of the work. He should help the teachers to interpret the value of their work in terms of the growth of the children. This means responsibility for leadership in curriculum building and for teacher training in service.

CURRICULUM DIRECTOR

In some large communities there may be needed a leader or director according to the administrative set-up. He or she should lead these consultants or supervisors in coordinating their work and in developing for themselves an overview of the curricular problems of industrial arts in the whole school system.

CHAPTER III: IN THE JUNIOR HIGH SCHOOL

The term "junior high school," as used in this bulletin, refers to a program of education especially adapted to the problems of boys and girls during their early adolescent years. The characteristics of these boys and girls during this period should determine the part which industrial arts may contribute to their education. In the broad sense in which a complete program of industrial arts is now conceived it becomes an essential element in the educational program of all boys and girls, but the means by which it is presented may vary to conform to the local administrative organization and physical environment.

The junior high school provides a period of exploration and guidance preliminary to choice of a career or vocational training. Industrial arts, as a part of general education, in these years (*a*) provides information regarding industry and workers; (*b*) reveals employment opportunities offered by industry; (*c*) satisfies the boy's and girl's desire to create useful things; (*d*) develops hobby and handy-man interests and abilities; (*e*) contributes to the tastes and judgment of the prospective consumer; (*f*) develops interest and ability in home repairs and maintenance; (*g*) affords practice in safety related to the school, home, and industry; (*h*) gives opportunity for cooperative effort in groups; and (*i*) illustrates and vitalizes the academic subjects.

These same interests prevail among boys and girls who are enrolled in the seventh and eighth grades of elementary schools. One of our urgent problems is to so organize our industrial arts teaching that boys and girls in these elementary schools may have opportunities that at least approximate those of the junior high school. Considerable progress has been made in this direction by means of an organization known as a general shop in which a variety of

activities are in operation simultaneously under the direction of one teacher.

EXPANDING INTERESTS OF ADOLESCENCE

The characteristics of adolescents provide the teacher of industrial arts with a rare privilege. It is his opportunity to capitalize the naturally expanding interests in the material things of our modern industrial civilization. *Exploration* through *investigation* and *experimentation* are practiced by very young children, but to pupils of 12 to 15 years of age these experiences take on a new meaning. In the earlier years the toy or make-believe approach, coupled with imagination, serves to satisfy their curiosity, but there comes a time when function and the details of materials and construction of an industrial product become increasingly important to them. Pupils' attention is drawn in many directions by a world of challenging problems in the field of industrial production. They seek through the use of tools and materials to solve these problems, but often, if their efforts are not supervised and stimulated, they are satisfied with very crude results. While serving the purpose of developing understanding to a limited degree, these efforts on the part of pupils lack attention to details of exact form and measurement, to the selection of the most appropriate materials, and to the best type of construction, all of which are so essential in a realistic world. Skillful teaching enters here, not to coerce, but gradually to develop an appreciation of refinement in workmanship, for there is no particular value to the individual in having made something unless it gives evidence of his or her own thinking, planning, and painstaking effort. The development of such an appreciation at this time is often the first step in the recognition and acceptance of adult standards of workmanship on which modern industrial life is so dependent.

While it is important that the educational program be continuously progressive at all times, it is particularly important during the early adolescent years that boys and

girls have their horizon greatly enlarged. This may be accomplished in many ways including a new school program, new surroundings if possible, and especially new things to do and learn. There is little educational value in their just doing more of the same thing at any school level. There *is* value in going to a different school, in being taught by different teachers, and in meeting and working with new classmates. In this changing situation *social adjustments*, as well as the development of individual traits, should be encouraged and stimulated, not as byproducts, but as desirable outgrowths of activities in which boys and girls are interested and in which they should carry a large share of responsibility. We should be interested in this sharing of responsibility because industrial-arts activities provide an excellent setting for its development.

Most boys and girls are not interested in skill as the term is usually understood, although in the past this has been the chief aim of many teachers of shop work. In this bulletin, consideration of boys' and girls' interests through which an appreciation of the value of skill may be developed, precedes the discussion of skill itself. It is not the intention here to undervalue skill, but rather to emphasize the educational value of knowledge, understanding, and appreciation. It is well also to consider skill as a *relative* term, based on the experience of the individual rather than on some definite measure of adult achievement. When interest and appreciation are made the controlling factors, and the worker achieves satisfaction in his product, the acquisition of skill should develop as a natural consequence.

Not only is skill a relative term, but it has many applications. There are mental skills as well as physical ones. In shop work, one can distinguish early between hand skills and machine skills. The former have to do with muscular control, particularly with regard to the fingers, hands, and arms in handling tools. Machine skills, while hand controlled, are dependent on power outside the human mechanism. The operation of an automobile is a common ex-

ample of machine skill, and one finds the need for these skills increasing rapidly in school and home workshops as well as in community life. The operation of the popular power-driven machines which are far from automatic, but which enable one to increase his output once their control has been mastered, is an example of machine skill. The use of such power machines has a definite value in interpreting the present industrial civilization to adolescent boys and girls. It is, therefore, a responsibility of industrial-arts teachers, through assigned study, class discussion, visits to industrial plants, shop work, and other desirable forms of industrial-arts activities, to develop in their pupils an intelligent understanding of the power age in which we live. Implications from interpretations placed upon industrial arts in this bulletin, if carried to their logical conclusion, would result in pupil outcomes for the realization of this educational objective.

THE MEDIA OF INDUSTRIAL ARTS EXPERIENCES

It would be futile to attempt in a junior high school program an exploration of all the many materials which are used in industry. It is possible, however, to use as typical, a number of the most common materials such as wood, metal, paper, paints, lacquers, inks, dyes, stains, and other materials that usually accompany their use.

Too frequently, however, industrial arts experiences have included only two or three kinds of wood from the hundreds which the world's markets supply, each with characteristics which make it most appropriate for some specific purpose. In the metals field, work has been confined largely to bar and sheet steel, to the neglect of other common metals such as copper, lead, tin, zinc, aluminum, pewter, brass, bronze, and other important alloys which have recently been introduced, such as stellite and Monel metal. The effort to provide enrichment of industrial arts experiences in keeping with modern practices must also include other materials, such as textiles and plastics, both natural and synthetic. The progress which is made in this direction depends on

industrial arts professional purposes. To confine one's efforts to a narrow field of materials is out of step with the rapidly expanding field of industrial materials in use at the present time.

Furthermore, the media of industrial arts should not be confined to materials. Consideration must also be given to the tools and machines by which materials are modified, and the power by which these machines are operated. Scaled and dimensioned drawings provide a language of form and dimension so accurate and unchangeable that there can be no chance for difference in interpretation. Printing provides the means for economical preservation and dissemination of knowledge. Electricity is a force without which our modern civilization could not exist. Ceramics is one of our largest industries and involves many mechanical processes. Textiles and foods furnish the base of large industrial organizations. If we accept a broad definition of industrial arts as a *study* of industries and industrial practices then all of the above, and more should be included.

It seems fair to say that on the junior-high-school level industrial arts is largely explorational. In the sense that vocational education means preparation for an immediate wage-earning occupation, any motive of this nature that is present among junior-high-school pupils is apt to be vague and transitory. This is especially true in the light of present conditions which place the entrance into occupational life beyond the junior-high-school age. But interest in industrial affairs in general is pronounced in boys and girls of junior-high-school age because they are beginning to realize their individuality and the importance or desirability of associating themselves with recognized enterprises of social significance. They find themselves surrounded by great organizations for manufacturing, for processing materials, for transportation, and for communication; they find themselves in a society intent on securing personal comfort and convenience in modern homes. Thus the desire for the possession of the products of the arts and the industries becomes one of the strong motivating forces in their lives.

Obviously, all types of industrial work cannot be duplicated in schools, so it has become the practice to select industrial activities in which large numbers of people are employed, on which they are dependent, in which they are interested, or by which they are served. From these activities teachers of industrial arts have chosen those tools and practices which represent great forces at work in industry but which may be brought within the range of practical experiences for pupils of junior-high-school age in school shops and school environment.

There is a tendency to increase the number of media for industrial arts, and some experimental centers have undertaken to show the value of including a much larger variety. The following is to be regarded only as an initial list for a constantly expanding program of activities: Woodwork, metalwork, printing and other graphic arts, electricity, arts and crafts, ceramics, textiles, foods, and planning—including drawing, reading, and design. Time, place, and circumstances all should influence the selection of media and activities through which industrial arts is to be presented. The constant shifting of our people raises the question of overemphasis on local industrial units, but because they are of community interest they should be considered, and in many cases be made quite prominent in the program.

COURSES OF STUDY

The preparation of courses of study for junior high school presents various problems which must be met. Even in relatively large schools it would be difficult to have a department or to provide a place in the program for even the units (media) which have been listed. It becomes necessary, therefore, to make combinations and to bring together in each unit those things which can be handled with the fewest additional tools. The much-criticized wood shop, which usually includes provision for various kinds of finishing with paints, lacquers, and varnishes, can very easily be adapted to include ceramics and leather craft. Printing as a graphic art may include bookmaking, linoleum cutting, photography, and etching. Metalwork may include sheet

metal, art metal, bench metal, forging, gas and electric welding, casting, and machine tool work. Because of the materials used, electricity may also be associated with metalwork. Drawing is distinctly a part of planning which should include selection of a project, selecting or making of a design, reading and making a working drawing, selecting materials and estimating costs, and developing a practical method of procedure.

Boys and girls should be interested in textiles, in the selection of their clothes as well as in their repair and proper maintenance. They need also to develop good judgment both in the appearance and serviceableness of their apparel. The same situation is true with regard to foods. They should learn to select proper food and also to prepare it. Aside from this consumer approach the mechanics of textile design and manufacture and of food processing provide interesting examples of industrial development, most of which have not received the attention they deserve in our educational program.

The work of the junior high school grades is here assumed to be for general education purposes and of a nonspecialized character. Industrial arts work organized in accordance with these requirements offers an especially desirable means for the realization of aims included in objectives for that educational level. Consequently, admittance to courses in this curriculum area should not be denied on the basis of sex. This statement, however, is not meant to imply that units of work, and even courses, that more generally accord with interests and occupational tendencies of one of the sexes than they do with those of the other sex should not be provided. For example, industrial arts work built about home crafts and industrial products, together with the services related to their use, such as textiles, including weaving, art needlework, and furniture and other home equipment, are more nearly in accord with manifest interests and activities of girls and women than with those of boys and men. Work of the heavy type in construction materials, such as wood, iron, steel, and sheet metal more nearly accord with

the interests of boys and men than with those of girls and women.

Past classifications of human activities according to sex, however, are breaking down. With few exceptions, the only real factor that indicates any considerable degree of permanency in the perpetuation of such classifications is physical ability. Even that, especially with the development of labor-saving devices in many occupations, does not restrict entrance into occupations according to sex as it formerly did. In view of these facts and the assumption that industrial arts in the junior high school grades is for general education purposes and not for specific training for a definite occupation, many of the limitations imposed by present practices upon the participation of girls in industrial arts work are without logical foundation. Experience shows that many girls do not confine their manipulative activities and their interests in the study of industrial products and services to things of the home, but are eager to express themselves through a variety of material media included in industrial arts work. In this connection it is also to be pointed out that pupil outcomes derived from industrial arts work, though it is offered as a part of the general education program, may have for some pupils propædeutic values for vocational work. It is quite probable that girls as well as boys may find in industrial arts courses the beginning of a permanent vocational interest and that the work will serve as a foundation upon which to build future vocational training.

It is to be understood that what has been said concerning industrial arts work for boys and for girls has been only from the standpoint of the value and appropriateness of such work according to sex, and has not taken into consideration any present administrative problems arising in connection with the programming of classes or with the instructional organization of the school. Experience indicates that in cases where a desirable educational end cannot be attained on account of a present administrative practice, the administrative practice in time will be modified in accordance with the educational need, provided it can be

shown of sufficient importance to warrant any additional cost that may be involved in making the administrative change.

Possible ways for providing industrial arts work to meet special needs of each sex and at the same time not deprive a pupil of one sex from what may seem desirable instruction for him (or her) in an activity that is usually characterized as special for the other sex include: (1) Organization of some courses in parallel classes, one to include activities that in general accord with the interests of one sex, the other to include activities that in general accord with the interests of the other sex, then permit exchange of pupils, either as a class or as individuals, as the local situation may indicate as feasible and practicable; (2) organization of some courses in which there will be a sufficient number of pupil activities and projects to permit some selection in accordance with individual differences, including those characterized by sex. The comprehensive shop lends itself to such a program.

Among the industrial arts activities that may be organized for instruction in accordance with the interests and abilities of junior high school pupils, including both girls and boys, the following may be mentioned:

Electricity, with special reference to its use in the home. Woodwork and wood finishing, with special reference to the use and care of wood products in the home. Elementary work in clay, including projects in pottery. Construction work that involves the use of paints, lacquers, and stains. Textiles, including the study of textile products and manipulative work in their construction. Art metal, emphasizing the making of articles of simple construction and design. Photography, including the taking of pictures of simple composition and their development. Printing, including the project of a small school paper.

Recognizing the wide range of materials which may be used as media for industrial arts experiences, it is obvious that one must either select only a few of them for detailed study, or else devote only a little attention to each of a large number. The choice between these two plans will depend largely on the purposes of the course of study. Since explo-

ration is one of the important purposes of the junior high school, it seems essential that a wide range of experiences be provided.

PROBLEMS OR ORGANIZATION AND ADMINISTRATION

Junior high schools organized with periods approximately 60 minutes in length often assign pupils to industrial arts classes for one period each day or a total of 300 minutes per week. Because of the time necessarily required to distribute and collect tools and supplies, a period shorter than 60 minutes is not considered economical. The shorter the period the greater is the percentage of time required for this distribution and collection. Three double periods of 90 minutes each per week are nearly equivalent to the 60 minutes per day, and schools with periods of less than 60 minutes should use the double period if a program, such as is being proposed in this bulletin, is to be made effective.

Schools employing more than one industrial arts teacher and with shops equipped for specific fields of activity such as woodwork, metal work, printing, and electricity, must decide which of these subjects should be taught first. From the point of using larger muscles first, letterpress printing with 12-point type, or larger, seems advisable, because it is concerned largely with assembling parts which have already been made. Electricity also, as usually taught, is largely an assembling process but it employs scientific principles and terms which are apt to be beyond the comprehension of seventh-grade pupils. Most pupils are more or less familiar with woodwork in the elementary schools, so this is often used as a point of departure in the seventh grade. Metal work, when employing thin sheets, is often less difficult, however, than woodwork.

Confronted with such a situation, it seems impracticable to attempt a logical sequence of industrial arts teaching units on the basis of the materials involved. As there are simple as well as difficult problems attached to all kinds of material, the solution seems to lie in selecting projects within the range of the pupils' ability and not on the basis of some logical sequence for introducing various materials.

Some schools rotate classes through four or more fields of activity in the seventh grade and permit a choice of subjects in the eighth grade. Other schools offer printing and woodwork in the seventh grade and metal work and electricity in the eighth grade, with election of any one subject in the ninth grade. Drawing is sometimes offered as a unit and in other cases is carried along with the shop work as a part of planning or industrial arts design. It would be difficult to prove that one method is better than another, so it seems more important to emphasize outcomes in terms of knowledge, skills, appreciations, and attitudes, rather than in terms of the sequence of teaching units based on materials.

FACILITIES AND EQUIPMENT

Reference has been made to unit shops and general shops. It has long been the practice to define unit shops as those which are equipped for teaching in a single field such as woodwork, metal work, forging, foundry, or printing. This type of shop is still most popular in large high schools. On the other hand, the general shop is equipped for a large variety of work to be carried on simultaneously under the direction of one teacher. In various localities school shops range all the way from one extreme to the other. Administrators are insisting that woodwork alone no longer meets the requirements of an industrial arts program, even in small schools. Therefore, the only solution for the small school seems to be in the development of a comprehensive general shop. When two or three teachers are employed in a school the multiple activities of the comprehensive general shop may be divided into groups to avoid duplication of equipment. When this plan is followed these shops become in a sense general shops for the particular division of work they represent, and are known as general woodwork shops, general metal work shops, and the like. Even in very large schools the general shop is sometimes used to provide introductory industrial arts experiences before pupils go to unit shops. Because school shops are used as centers for exploration and experimentation the term "laboratory" is com-

ing into favor with some people. More important, however, than the name is that these shops or laboratories be adequately equipped with work stations, hand tools, power machines, and necessary materials to suit the activities for which they are expected to provide. They should also serve as a source of information, such as found in samples, reference books, catalogs, and other types of illustrative materials. The work should be under the direction of broadly educated, professionally trained, skilled, and versatile teachers.

Not many years ago when the woodworking shop was almost the only kind of school shop known, it was customary to provide each worker with a full set of woodworker's tools. In time it was realized that many of these tools were used only occasionally, consequently, it became a practice to provide for each work station only those tools which are most essential. In accordance with this practice it is necessary to provide a limited number of each of a wide range of tools to be used in common by all pupils in the class. In the general shop only a few tools of any one kind are needed, because with the variety of work under way, only a few pupils will be employed in any one division or on any one process.

Until very recently it was necessary to employ large machines, such as are used in industrial plants, in order to provide important experiences. In this connection it must be remembered that tools and machines in schools are more abused in their use than they are in industrial shops, because in school they are used by inexperienced workers. In the past few years there has been an unusually fine development of small sturdy machines which will stand up under school use. Therefore, it is no longer necessary to use large machines in order to secure rigidity and durability. The precise use which is to be made of machines should be the deciding factor as to size. For large, heavy work, large machines are essential, but for most projects undertaken by pupils in junior high school small, sturdily built machines will suffice.

Because of its complexity, the planning of a school shop requires very careful study. There are many details which must receive attention. For example, there is the matter of storage. There must be a place for materials which are often bulky, but which need to be readily accessible at all times. A place for the storage of unfinished work of pupils is also very essential. Each tool should have its proper place, and when not in use should always be there. This implies organization and responsibility which should add materially to the educational experiences of a school shop by increasing the responsibilities of the pupils working in it.

There are many ways of caring for tools and supplies. Some teachers prefer tool rooms or tool cribs, some prefer small wall cabinets, while others prefer to keep tools in bench drawers. It would be difficult to say that one method is better than another, but it is important in each case that a definite plan be developed, and that pupils be required to follow the plan without variation or exception. This is a type of formal experience which helps to develop individual responsibility as well as social cooperation.

In each school shop there should be open floor space provided for the assembling of large projects. Aisles should be wide enough to permit free movement about the shop without interfering with other workers, and there should be some arrangement for comfortably seating all pupils during a class discussion or demonstration. When pupils are called together without satisfactory arrangements for their comfort, they soon become inattentive, especially when they cannot see the teacher and his demonstration.

When the sessions for recitation or demonstration are short, pupils may sit on benches without becoming fatigued. A more satisfactory method, however, is to provide movable stools or to attach a swinging or revolving seat to each bench, or to provide chairs or benches in a space set aside for conferences. The latter arrangement is quite common, but seems extravagant in the use of space, considering the small amount of time the seats are in use. In shops where

large benches are desirable, a combination arrangement has been devised by attaching swinging seats to the frames along both sides of the benches. These benches serve well for class discussion purposes, and at other times provide work stations for various kinds of activities. Certain types of equipment may also be mounted on these benches without interfering with their other uses.

Lighting in school shops should be adequate, with 12 to 15-foot candles considered as a minimum. Temperature in the shops may be somewhat lower than in classrooms, because the pupils are usually moving about, but ventilation should be equal to that provided in any other part of the school building. Dampness should be avoided, not only for the well-being of the teacher and pupils, but also to avoid rusting of tools and deterioration of stock. The objection to the use of basement rooms is due to the fact that these desirable conditions frequently do not prevail. There should be no objection to basement rooms when these important features are properly provided.

The matter of providing safety devices is an important element in school-shop planning. All power-driven machines should be provided with approved guards. Contrary to quite common opinion, guards are available which seldom interfere with the operation of machines. In the infrequent situations where standard guards cannot be used, special guarding devices can be improvised. Guards do, in some cases, slow down production, but safety should be of more importance than speed in school shops.

In these days of enlarged classes, careful consideration must be given to what may be called work stations. This term should include not only places to work with tools, but also opportunities to participate in the shop management. Fifteen pupils are too many in a shop that has only 10 work stations, while 40 pupils may not be too many in a shop with an adequate number of work stations and where instructional practices are efficiently organized. All too frequently the necessity of the latter condition has been overlooked, with the result that pupils have lost interest, dan-

gerous situations have developed, and teachers have become discouraged.

Detailed lists of tools, machines, and supplies cannot be given here because of their great variety. Many studies have been made to learn just what kind and amount of equipment should be provided, but until local standards have been established, it is better to underestimate the needs and gradually build up the equipment on the basis of experience. There is little that is more disconcerting to administrators than expensive equipment which is not frequently and purposefully used.

TEACHING AIDS

Books have a peculiar significance in industrial-arts shops. They are seldom used as texts, but as a source of information their use as reference material is increasing. Several things may account for this situation. Not so long ago the teacher carried all of the essential knowledge in his own mind and passed it on to his pupils by lectures and actual demonstrations with tools and materials. Imitation is still one good way of learning, but with the accumulation of good books, and the recognition given to the interests of individual pupils, school programs are growing in breadth. The time has now arrived when a library of good books is an essential part of the equipment of every progressive industrial-arts shop, and evidence of their frequent use is an indication of one factor in good teaching. To the extent that books are used to stimulate self-activity on the part of the pupils, they become teaching aids. Magazines which deal with scientific and shop problems should also be classified under the same head. There are other teaching aids, such as instruction sheets, designed for use in school shops. These instruction sheets may be subdivided into assignment sheets in which the specific requirements of a project are made clear, operation sheets which provide definite instructions for tool processes which pupils should not be expected to discover nor to learn by trial-and-error experiences, and related information sheets, which serve to provide the "why" of an activity as well as information about the materials used. They are quite valuable, particularly in large classes,

and their value is measurable by the extent to which they stimulate pupils to do their own thinking and planning. Other important teaching aids are bulletin boards, pupils' notebooks, reports by pupils to the class, films and slides, models, charts, photographs, catalogs of tools, equipment, and materials, files of industrial information, illustrative materials, permanent and temporary exhibits, school and other libraries, museums, and visits to factories or other industrial establishments.

THE CONTRIBUTION OF INDUSTRIAL ARTS

Social adjustment.—Perhaps the greatest development in the field of industrial arts in recent years is the recognition of its social contribution. Many educators look upon industrial arts in its broader concept as a great integrating force in the development of a new educational program to meet changing social and economic needs. For pupils in their early adolescent years, industrial arts has an almost universal appeal. There is something about working with tools and materials that holds boys' and girls' interests although these same persons may have quite diverse purposes back of their activities. These purposes may range all the way from recreation to serious problems of research, but the genuine interests on which they are based provide a foundation for the development of character and social adjustment.

The measure of pupil achievement.—The recognition of new values should not cause the old ones to be displaced. There is rather a change in emphasis. We should still keep records to discover what pupils and teachers have achieved, the former in terms of learning of various kinds, the latter in terms of areas or units which have been presented and made a part of the pupils worth-while experiences. Too often, however, achievement has been measured solely by the products of tool manipulation. Important as these are they are not sufficient. As a result of their industrial arts experiences, pupils should show evidence of growth not only in the matter of tool skills, but also in their understanding of and the reasons for the things which they have done. They should have developed a wholesome attitude toward

their fellow workers in situations which, by their very nature, require consideration for others as well as cooperation with them. The outcome of industrial arts experiences should be of at least three kinds: First, *skill* in the use of tools, the development of good methods of procedure, and in the selection of appropriate designs and types of construction; second, *information* concerning the qualities and characteristics of materials, their source, their abundance or scarcity, their relative values, and their past and present contribution to industrial and social activities; and, third, *social habits* and *attitudes* which help one to be successful in his relations with his associates. The third group includes a reasonable willingness to cooperate with others and to have consideration for their convenience and welfare, a reasonable willingness to assume responsibility, and a reasonable reliance on one's own ability. When properly organized and properly presented these industrial arts experiences provide excellent opportunities for exploration and guidance.

In contrast to the old idea of manual training with emphasis almost entirely on tool skills, the present-day concept of industrial arts includes a broad program for the development of various skills, informations, and attitudes. This means that interests should not be centered so exclusively in the material products as to crowd out those more subjective but highly desirable values of related information, of cooperation, and of responsibility. One must realize, however, that in setting up such objectives as these there may be some appearance of duplicating the work of the physical sciences, the social studies, and economics. It is desirable to bring about a more complete integration that leads the pupils to understand that everything they do in the shop is based on some physical science. At the same time pupils in other departments of the school should learn that the school shops are laboratories where they may put into practice the principles and informations acquired in the classes in other subjects. If the work in each of the subject-matter departments is organized and carried out so that it supplements to the fullest extent the work of all other departments in their efforts to realize the educational objectives of

the school, the greater will be the opportunities for the pupil to unify his efforts for a general education.

Pupil personnel—training in self-government.—Due in part to the enlargement of shop classes, the participation of pupils in shop management has been given much attention in recent years, and the term "pupil personnel organization" has come into use. Discerning teachers see in the experiences attached to such an organization an opportunity to emphasize the value of leadership and cooperation. One may read much about pupil foremen and assistants who take care of the distribution, collection, and care of tools, the maintenance and operation of machines, the conservation of supplies, the records of attendance and achievement, and constant checking and observation to promote safety. The development of such an organization differs from the usual concept of a class—in fact, it becomes a community in which individual responsibility and social interdependence are both essential factors.

A class organization which involves pupils in its management brings to the teacher of industrial arts a new responsibility. Instead of dictating each step in the class procedure, a practice which is quite common in industry, he becomes an adviser, a consultant, and a source of information. He is required to study his problem with the definite purpose of becoming an efficient classroom administrator, having as his goal, optimum learning experiences for each pupil. Classes organized on this plan are no longer rare. They are being organized because they provide an opportunity to practice more completely that which we have long proclaimed; namely, "we learn to do by doing." Teachers who are conducting classes of this type have accepted the idea that industrial arts as a subject includes much more than tool and machine skills.

Safety education.—Safety in the industrial arts shop means more than machine guards. Important as these devices are, their use should be merely a part of the whole school program for the avoidance of accidents of all kinds. Efforts to avoid accidents in school shops may well be a part of the pupil personnel operation. Accidents usually

occur because of carelessness on the part of someone. Definitely established habits of alertness, together with a clear understanding of the chances for accidents when the proper procedure is not followed, tend to lessen accidents. But safety is not confined to the proper use of tools and machines. All the factors which are used to assure the physical well-being of pupils apply in the shop as well as in other parts of the school building. The teacher who has developed an efficient pupil personnel organization in his shop will not fail to include safety education as one of its important phases.

Equality.—Regardless of their future vocations or professions, pupils when they work in the school shops meet on common ground. Here they may create material things in accordance with their individual ideas and interests, and in doing so reveal their own interpretation and understanding of modern industrial civilization. Here they may explore and experiment; here they may bring their mathematics, science, language, and even history and put them to work; here tangible material results give evidence of technical knowledge and skill. Here is an opportunity to bring skill, knowledge, and attitudes together in the development of character.

Aesthetic appreciation.—There is still another value which should not be overlooked. One writer expressed it when he wrote, "As the sun colors flowers, so art beautifies life." It is not enough that material things shall function. There is a growing demand that they shall appeal also to a sense of beauty, and when a thing functions well in all respects, it is unavoidably beautiful. Therefore, pleasing form and color, which includes both design and decoration, should be studied to develop appreciation for the finer manufactured things of daily use.

Art form as well as the materials used in construction determines in large measure the quality of an industrial product. Many of the materials used in industrial arts have an intrinsic beauty of color or texture of their own, and to many others beauty may be contributed through the process of manufacture. The workability of industrial mate-

ials is conditioned by their hardness, malleability or ductility, or by other characteristics. The durability of a material used is also to be taken into consideration. Thus, the art form of an industrial arts product will depend largely on its degree of fitness to meet the purpose for which it was intended, the beauty of its construction which includes proportions and workmanship, as well as finish, and finally, its decorative value, to be considered in relation to its intended surroundings. Design, which is the controlling factor in all the arts, must be made to permeate the entire industrial arts program.

CHAPTER IV: IN THE SENIOR HIGH SCHOOL

THE SCOPE

Senior high schools and vocational schools provide a period of advancement toward a chosen goal. Industrial arts as a part of general education contributes to this end by: (*a*) developing an appreciation of design and quality in manufactured products; (*b*) providing practice in the use of materials and tools for recreation and home utilization; (*c*) sampling a variety of industries, through advanced school courses, in preparation for entrance as a beginner into the skilled trades or into college courses in engineering and architecture. Industrial or trade education as specific training prepares for entrance into the skilled trades with advanced apprentice standing, and provides, with other subjects of the curriculum, a background for later promotion to minor executive positions in industry.

A shifting emphasis.—As has been previously stated in this bulletin the basic or fundamental objectives of industrial arts obtain for all educational levels. There is, however, a continually changing emphasis to meet the shifting interests of boys and girls as they approach adolescence and continue toward adulthood or maturity. Many educators believe that senior high school shop work should emphasize, or at least include opportunities for realizing, industrial vocational values.

The value of industrial arts as a contribution to the general education of all children is being more generally recognized, and in line with this attitude there is an increasing tendency to provide industrial arts experiences for girls. The exploratory interests of the junior high school pupil are motivated by curiosity about things, how they work, how they are made, and what purposes they can be made to serve. These interests, which were discussed in the chapter on junior high schools, begin to crystallize into desires that are more definitely vocational as the pupil advances to higher educational levels. Consequently, we find him evaluating

each school subject according to the use it appears to have in a very practical world. He has been encouraged in this by the emphasis that parents and teachers have placed upon a "life work" or a vocation. Therefore, the industrial arts shop in the senior high school must answer satisfactorily questions as to practical values related to occupational life if it is to hold the interest of the high-school pupil. By this time some pupils will have chosen to enroll in trade schools with the single purpose of preparing for a wage-earning job. Many others, however, will prefer to continue with a more general program of high-school subjects, including shop work, and to defer for at least 2 years, the specialized training which is essential for entrance into certain highly skilled occupations.

Among the industrial arts activities which may be included in the more general program mentioned above, some will be a continuation, on a more advanced level, of those found in the junior high school. Others will represent new activities or activities involving more complex projects than could be offered in the junior high school because of the more mature interests and abilities which they demand. Printing, including the making of sketches for advertising displays is a subject of value for both boys and girls. Photography, including composition, color and form, enlarging and developing, is an excellent activity to engage the interest of both boys and girls. Art metal work, including metal spinning and the making of simple forms and designs in jewelry, accords well with the interests of boys and girls of the senior high school level. Textiles, as applied to articles about the home and clothing are important from the standpoint of the consumer. Furniture, including activities for the study of design, materials, and use, especially in reference to the selection and purchase of articles for the home is a subject of large concern in the life of the individual. When properly taught, industrial arts studies of textiles and furniture will make for the improvement in taste, personal dress, home decorations, and the selection of home equipment. Ceramics, including proj-

ects which emphasize proportion and design should be included for the making and decorating of articles used in the home. The values to be derived from such a course are of equal worth to both boys and girls. For pupils in the senior high school a course in house planning is highly desirable for girls, and also for boys if they have not had courses in drafting that would include this objective. The purpose of the course would be to develop abilities and skills necessary for intelligently planning the construction of a house in accordance with good architectural requirements, good arrangement for the purposes it is to serve, good construction, and economy in costs. Within the limitations set by the purpose of instruction, the course would include (*a*) instruction in the reading of house plans to a degree of proficiency that would enable the individual to understand house plans found in non-professional literature; (*b*) instruction in making sketches of house plans which would be useful in conveying to an architect clear conceptions upon which he would base his drawings; (*c*) instruction in kinds and uses of building materials; and (*d*) instruction in estimating costs.

For principles governing the selection of activities in industrial arts for boys and for girls, the reader is referred to statements made in connection with the junior high school program.

The question is sometimes raised as to the relationship between industrial arts and other school subjects, especially the social science subjects. It seems plausible to believe that every subject and every department in our American system of departmentalized schools contributes generously to the cardinal objectives of education. However, each department has its own specific contribution to make to the program of the school, and school administrators view the function of each department in the light of the specific and peculiar contribution that it makes toward the realization of the general objectives of the school. Such a situation makes possible desirable correlation between subjects in the school curriculum but the independence of each subject-matter field is not thereby invalidated.

The emergence of industrial arts.—Industrial arts has emerged as an important part in secondary school programs. It is no longer considered a subject in the same sense as is arithmetic or woodwork, but is being recognized as dealing with a whole area comparable with that covered by such designations as the "social studies", "the exact sciences", "language education", or "health education." The phrase "social studies" carries implications far more significant than does the enumeration of such subjects as history, civics, and economics. Likewise, industrial arts has come to mean a broad program—the organization of economic, social, scientific, materialistic, and idealistic knowledge, as such is related to the lives of people in an industrial age. It is concerned with material media—materials of instruction, tools, and processes—that are significant in developing the values which industry contributes to life. Not until this large concept gained quite general acceptance did industrial arts make for itself a secure place in the American high-school family of accepted studies.

For teaching purposes and to facilitate school organization, industrial arts is broken down into units or subjects such as woodwork, machine shop practice, printing, drawing, and electrical work. Following much the same line of reasoning that has produced courses in general language, general science, and general courses in the social studies, there has also come into use the general or diversified activity shop, with its great variety of industrial arts experiences.

Whatever the form of shop organization found in the senior high school, whether a general shop course or a series of unit shop courses, industrial arts represents a whole field or area in our educational plan. This concept is essential if industrial arts is to be developed to achieve its full purpose as an integral part of the high-school curriculum.

General acceptance of industrial arts.—Industrial arts is accepted as an integral part of any well-rounded high-school program. According to many studies, including the recent National Survey of Secondary Education, the non-academic high-school subjects, among which industrial arts is prominent, have shown decided gains over academic subjects during the last 30 years. However, in an effort to maintain or

restore the former prestige of traditional subjects, certain programs are being arranged and certain requirements are being made that, for the time being, seem to work to the disadvantage of the nonacademic subjects. For example, there are instances where civics is a required high-school subject by legislative enactment; economics is required by the local school board; by practice of long standing, 4 years of English, 2 years of mathematics, 2 years of history, are still often required. These specific requirements have been added, one here and one there, until time is lacking in the high-school program for a student to take the nonacademic subjects. The concept of vocational education has also been equally narrow in some places, and this has tended, as in the case of the academic overemphasis, to eliminate the opportunity of enjoying and profiting by industrial arts experiences.

Another factor affecting the standing of industrial arts in the high-school program is the practice of administrators in assigning the socially ill-adapted to the school shop. There is evidence that the industrial arts program is adapted to the needs of many of these maladjusted boys. However, there is danger that the presence of too many of the maladjusted pupils in the shop may create a bad impression among the more discerning and brighter pupils. After all, pupils will profit from contact with a good industrial arts program according to their ability to learn and to work with a group; therefore, the greatest value will go to the socially normal pupils. The real solution of this problem probably will not be found in a direct attack on any of these too common practices, but rather in a more careful study of potentialities of individuals as well as their interests, and in the selection of those experiences which will contribute most to the development of the possibilities in each individual. Some will profit most by academic experiences, others by the acquisition of tool skills, but the great majority will probably be served best by a generous sampling of all fields, a situation which demands a much greater integration of subject matter than we have had in the past.

As evidence of a more liberal attitude toward high-school programs we would direct attention to the recent action of

certain colleges in which additional recognition is granted to nonacademic subjects for college entrance. Of still greater significance is the experiment being carried on in various high schools whereby many colleges have agreed to accept graduates on the recommendations of principals without reference to the subjects taken in high school. There is evidence that academic standards still prevail in most of these experiments, but there is a principle involved which presages a great future for industrial arts. However, in order to take advantage of this situation industrial arts must broaden its program far beyond the mere acquisition of tool skills. When carefully analyzed and properly presented, we shall find that industrial arts provides application for the exact social sciences; a recognition of this fact will hasten the integration to which reference has already been made. Many high-school principals are accepting industrial arts as a major factor in this broader concept of secondary education.

THE VALUES

In agreement with accepted objectives.—The objectives of industrial arts education are identical with the accepted objectives of any good high-school program. If properly administered the industrial arts program will contribute its full share to the education of the whole child. The subject matter, the teaching methods, the activities in which pupils engage, provide some of the finest situations for developing ethical character, creating a sense of good citizenship, promoting thrift, developing a keen appreciation of fine things produced by good craftsmen, and for building a clear understanding of the problems which confront those who do the manual work of the world.

These values need emphasizing during the adolescent high-school period. As shop work holds the interest of high-school pupils, it is able to contribute much toward these educational objectives. Many cases can be presented to prove that industrial arts has saved boys to a full high-school course, and in some cases also to higher educational levels. One should not list as the chief objective the "saving of misdirected boys", nevertheless, this outcome is altogether

too important and too frequent to omit it from the objectives of industrial arts on the senior high school level. As stated previously in this bulletin, the values of industrial arts obtain throughout all levels, that is, elementary, junior high school, senior high school, and adult school, but this particular value, that of redirecting the interests of boys, becomes of outstanding importance when one realizes that school attendance in the senior high school is dependent generally upon interest and not upon compulsory school attendance laws.

The specific aims and values for industrial arts will be treated in relation to the subject matter and general problems in organizing the program. Let it suffice here to say that the important aim is to teach the use of tools, machines, materials, and processes as they affect man in his effort to make a more satisfactory place in which to live.

General or nonvocational versus the vocational.—Industrial arts was introduced into the public-school curriculum to make education more practical. This idea was based on the supposition that work with tools and materials is always practical while study through the media of books may not be so easily applied to everyday situations. Of course this is not necessarily true for either supposition. It would seem appropriate to emphasize that either manual education or academic education is practical when it fills a need in an individual's life. Social education, economic education, health education, or music education are all practical when they contribute to an individual's usefulness. It is unfortunate that industrial arts education has been promoted with the argument that it is a practical subject and thereby inferring that some other subjects are not so practical. Industrial arts education is able to stand on its contribution to the education of the whole child, not on a comparative rating as to whether it is more or less practical than some other subjects. It is quite necessary that this more cooperative concept shall be the basic philosophy for formulating the high-school program of industrial arts if it is to be accepted by all persons who are concerned in developing a good general educational program.

The concept of what constitutes a practical school subject will affect the concept of what constitutes vocational educa-

tion. It would be difficult to conceive of any program of secondary education which did not attempt to give vocational direction to the pupils who are to come under its influence. Spelling, writing, arithmetic, and bookkeeping could be considered as most definitely vocational if and when they are used to prepare a high-school pupil for a job as a bookkeeper. Nevertheless, one seldom thinks of spelling, writing, and arithmetic as vocational subjects unless they are definitely listed in a training program as preparatory to specific employment. It is just so with all the subjects that comprise the whole field of industrial arts. As a part of the general education program of any high school many industrial arts subjects may lead into definite vocational study.

Society and industry have undergone great changes. Industry is making new and more exacting demands on those who enter its ranks. In many cases general industrial intelligence is a greater asset than highly developed specialization. This new situation gives a new significance to industrial arts which, because of its diversified program of shop work, fortified by other high-school subjects meets so frequently the demands of modern industry.

ADMINISTRATION AND ORGANIZATION

Administrative responsibilities.—It has become a common practice for the general school administrator having responsibility for a program of industrial arts to enlist the services of a qualified person in that field. In some situations it has worked very well to bring someone into the administrative offices in a supervisory capacity. In the larger school systems the whole program of practical arts education is often placed in the hands of an administrative director or assistant superintendent. The school administrator in the smaller schools will often rely on the advice of one of the teachers of industrial arts. The vital thing, however, is not the way in which the responsibilities are met, but that they be recognized and handled as problems requiring the best thought available.

The administrative responsibilities which are here enumerated are problems which confront the administrator on

any level, but the problems involve more money, and the decisions become more complicated on the high-school level; it has seemed expedient, therefore, to discuss certain of these responsibilities.

1. Relation to the whole program: Industrial arts must be planned as an integral part of any well-rounded high-school program and be treated as a regular subject. Such treatment is the first step in establishing industrial arts in its proper place in the school. Industrial arts should be as much a part of the program of studies as is English and mathematics. The teachers of industrial arts should meet standards equal to those of other teachers. After all, integration of industrial arts is an attitude of mind on the part of administrators, and reflected by both teachers and students, which recognizes it as an area in education equal in significance to any other.

2. Specialization: There are many features of an industrial arts program which indicate that it is a field of specialization. Special equipments are required, and special rooms are necessary as to size and arrangement.

3. Qualifications: The high-school teacher of industrial arts must be a versatile individual, equipped not only with a liberal general education but also with pronounced competency in at least one craft trade and the technical information related to it.

4. Size of classes: The size of class which can be accommodated is dependent upon so many factors that no general statements can be made. One point of primary importance is that the size of the class should be limited to the number of work stations which are provided. The number of work stations may be determined by the size of the room.

5. Courses of study: The fact that industrial art draws its materials of learning from the varied craft trades and industrial activities of life makes the selection of learning units one of the most perplexing problems. The early concept of manual training led the educators to emphasize the use of wood in relation to the tools and processes of woodwork. The present concept of industrial arts includes not only wood but metal and clay and fibers—in fact any material that man has used to affect his living conditions. In some situations the courses of study have been developed

in very specialized subjects, such as pattern making, wood turning, machine-shop practice, welding, or forge work. The inability to provide shops for so many specialized courses has encouraged the development of general shops in which various specialized activities are combined into more general courses covering a great variety of activities.

6. The planning of shop lay-outs: The installing of the necessary equipment in a shop or laboratory for teaching industrial arts requires an unusual amount of planning. While the purpose of shop work is educational, the effectiveness of instruction depends largely on the practical qualities of the equipment and the manner in which it is arranged and operated.

7. Supplies and equipment: The supplies and equipment used in the teaching of industrial arts are the important factors of differentiating the work from other school activities. With the possible exception of high-school science, the quantity of supplies consumed is greater than those in any of the other subjects. The capital cost outlay for equipment for courses in metal work on the high-school level requires expensive machines. The hand tools require very careful selection as each tool, though usually designed for a mechanic in a specialized trade, must serve a multitude of functions in the school shop. Schools have been unable to buy school equipment for shop work on the same specifications as industry. The making of tool and supply lists, together with proper buying specifications, becomes one of the important responsibilities of administering an industrial-arts program.

Administering the program.—The problem of administering a program of industrial arts is, after all, a problem of getting all concerned to work together. As previously explained, integration of the program into the fabric of the whole educational plan is the ideal to which every industrial arts teacher or supervisor aspires. It is equally necessary, however, that the school principal and other administrative officers upon whom the responsibility of carrying out the program may fall shall recognize the need of highly specialized talent.

The organization of the work.—In industrial arts, the same as in other fields of study, the content material must

be selected and arranged in accordance with the mental processes involved in the different kinds of learning included. In much the same way as the courses in other social studies are organized by selecting units representing some of the multitude of organized social relationships as found in geography, history, economics, civics, and sociology, industrial-arts courses should be organized by selecting from countless industrial processes used in manufacturing and from numbers of highly organized trades in which skilled workers have participated for ages, those units which will best show accord with the social needs. These processes and trades present themselves in a most confusing and multitudinous array to the curriculum maker. The problem of selecting, eliminating, and finally of organizing the content material for industrial arts should, therefore, be frankly recognized as a difficult one and careful attention be given to it by persons trained in a knowledge of industrial life and in sound educational principles.

Organization of subject matter based on industrial trades has been the general practice for work on the high-school level. This has resulted in unit courses in machine shop, pattern making, forging, foundry, etc. The general or diversified shop idea has been gaining acceptance in many situations and this has modified the unit shop organization to the extent that groups of closely related activities or trades have been developed in general metal, general wood, general electricity, and other groupings. About the only difference between the unit shop and a general shop is that in the latter there are no actual partitions separating the shop into separate rooms for each unit of work. A close examination of the organization of the subject matter for each type of shop will disclose that the unit trade is usually the basis of organization. In other words there may be in a single shop, areas set aside for pattern making, forging, machine shop, and other units of equipment.

In certain educational centers where extensive research has been done in the field of industrial arts organization the "laboratory of industries" has been promoted. Here one will find a new philosophy of industrial education. The units are no longer trade units but are selected from broad areas of human endeavor in the whole field of industrial

work. Here the approach is made by introducing the pupil to the graphic arts, the metal industries, the materials of industry, and other similar designations intended to convey the broader and less-restricted motion of industrial activities.

INSTRUCTION

Characteristics inherent in good teaching in industrial arts.—Teaching methods have been affected by the improved physical equipment, by the contributions of highly professional teachers, and by the general increase in class size. These three factors are more conspicuous in their effect on the high-school level than on any other.

There has been a willingness on the part of school authorities to install rather elaborate equipment in their high schools; there is evidence that too much money has been spent for machine-tool equipment that is not vital for instructional purposes in some instances, but the more liberal expenditure of money has resulted generally in having some very superior teaching tools and materials. The conclusion that school shops do not need to parallel industrial situations has simplified the teacher's problems because he now feels free to recommend school shop equipment based strictly on school shop needs. This alone has had a far-reaching effect on teaching methods and techniques.

The industrial arts teacher needs to be not only a highly trained professional person but also a good mechanic, an artisan, and a craftsman. In addition to the craft skills he must bring to the high-school organization the same college training and the same breadth of view in regard to the social, economic, and political conditions (welfare) of the community as his more academically trained associates on the high-school staff. The social viewpoint is so significant in the industrial arts teacher that his attitude toward pupils is commonly much more human and more understanding than those who deal with less concrete situations. He is much beloved by his pupils because of these qualities.

It is a combination of these human qualities, professional preparation for teaching, and resultant understanding of social and economic needs, that has stimulated some very

superior teaching methods by industrial arts teachers. In fact most of the methods and techniques commonly referred to as "progressive methods" in our current literature are accepted and practiced by the industrial arts teacher. The very roots for such concepts as "individual needs," "individualized instruction," "socialized recitation," have their beginnings in the activity program as provided in the industrial arts shop. These statements are not intended to place undue credit on the teachers of industrial arts for their excellent contribution to the whole field of education but rather to show that the subject itself stimulates just that kind of a contribution.

It is only fair to acknowledge that some of the great values that are now seen in the manner in which shop classes are conducted have been forced upon the industrial arts teacher. For example, the pupil personnel system of organizing a shop class so that it becomes largely a self-governing unit was necessary as a device for handling large classes. This particular system has been explained in the treatment of the junior high school. In the senior high school it brings out leadership and suggests some approach to foremanship training. Safety education is perhaps one of the greatest contributions of industrial arts to vocational efficiency. The use of instruction sheets and working plans puts upon a pupil the challenge to solve his own problems in a way that no other subject in the curriculum can possibly do. So it may be said that the challenge of large classes, the organizing and selection of subject-matter from so vast an area of material, the administrative ability required to maintain in working condition such an array of supplies and equipment as no other teacher even approaches, requires strong virile teachers whose methods and techniques are an inspiration to the teachers in all other classes.

The text or reference book.—The teacher with limited experience will find the effectiveness of his teaching greatly improved if the learning units are developed with the aid of a well-written text. The pupils get a certain feeling of satisfaction and respect toward the subject, when a textbook is used as a good reference source. There is evidence that the well-directed use of a textbook enables the pupil to work

more effectively while in the shop, because the teacher does not have to spend time lecturing about subjects that are adequately treated in the text.

The scope of the subject matter for shop work on the high-school level is so vast that it is impossible for any teacher to be well informed in all phases. The teaching load, that is, the number of pupils per teacher and in some cases the longer school day, requires the teacher to conserve his energy for teaching; therefore, from the physical point of view the teacher should not be required to write his own text material. There is considerable evidence that much of the mimeographed material heretofore in use is not carefully written or well organized. The net result from the use of miscellaneous mimeographed material and other assembled texts is often a type of instructional material of poor quality as to English and typography.

It may not be possible to secure a basic text to cover some of the general shop courses. A few reference books, carefully selected, may be placed in the shop in sufficient quantities for the needs of a class. Emphasis is placed, however, on the desirability of using such texts even though only three or four are available. A library of pertinent material is essential.

The high-school shop.—The shifting emphasis for industrial arts on the high-school level focuses our attention on the equipment and general plan for the high-school shop. How shall it differ from the junior high school shop? Shall the tools and machines be larger, more extensive, more specialized? The principles upon which the high-school program is based should answer these questions.

THE CONTRIBUTION TO VOCATIONAL EDUCATION

Changing social and economic environment is emphasizing new values for old objectives. The principles and processes which underlie industrial occupations have been quite generally accepted as being the basis for the organization of the subject matter of industrial arts. The rapidly changing methods in manufacturing have emphasized the inadequacy of narrowly specialized trade training, and the demand for young workers with a broad, diversified training seems to show that the experiences with a variety of mate-

rials, machines, tools, and processes have become a desirable kind of trade training. At least the broad training as suggested in a good program of industrial arts increases the effectiveness of later intensive, specialized trade courses.

The contribution of industrial arts to industrial trade training is too obvious to require proof. It is not necessary to justify a strong industrial arts program in a senior high school on the vocational need alone; the fact that 28.9 percent of all persons 10 years of age and over gainfully employed in 1930 were working in manufacturing and mechanical industries indicates that the vocational values of industrial arts are important. There is justification for specialized trade classes in some of the more inclusive trade units, but only larger communities will be able to provide instruction in more than a few trades. Since the great majority of our youth will be attending comprehensive high schools until they are 18 years of age, it is evident that the high-school industrial arts program represents about all the contribution that many schools can make toward vocational education.

The realization that industrial arts has great value because of its contribution to industrial vocational education does not appear to have originated among the school people. Wherever industrial leaders meet to discuss the problems of manufacturing, the acute shortage of skilled workers is the topic of primary concern. The keen observer will soon detect that their prescription for alleviating this shortage is to develop stronger and more effective industrial arts programs. The demand on the part of industry that the schools shall direct more youth into the skilled occupations should not, however, influence the schools to place undue emphasis on employment as an outstanding objective for industrial arts. Consumer values, exploratory experiences, the development of leisure-time interests, and the essentials of a general education, will always remain coordinate and dominant objectives for an industrial arts program in the senior high school.

SAFETY EDUCATION

The only excuse for emphasizing safety education by making it a special topic in this bulletin is because indus-

trial arts education can contribute more in this field than any other division within a school organization. Safety education represents an outstanding social need at the present time. Industrial education deals with the effect of the machine on our social order. Machines have placed people in hazardous situations, and the use of machines has taken a toll in human life as has no war or pestilence. Therefore the subject-matter of industrial arts must deal directly with safety in relation to the machines which are used. The attitude that "the right way is the safe way" must be developed. The general shop and the pupil personnel organization provide ideal situations for making pupils safety conscious.

Techniques and devices should be developed for teaching safety with as much care as the teaching of any skill. The shop teacher may well set up some very definite activities in safety practice. The moving picture, the picture slide, and the poster are in use in many schools. The post of "Safety Engineer" in the class organization makes instruction vital. It is rather impressive to have one member of the class wear a badge or emblem of this important office.

The practice of requiring each student to take some kind of preliminary examination before being allowed even to start work on a machine has been found an effective teaching aid. Teachers will find that safety can be made the basis for good housekeeping, orderly conduct, and industrious work.

A new philosophy of education for secondary schools is being advocated. A study of the history of educational development in this country indicates that every generation of adults in their turn have recommended changes for the youth immediately following their own era. In general, changes are not readily accepted and adjustments are made slowly. May we not assume, therefore, that changes recommended in our present educational plan as it applies to secondary schools may fare about the same as recommendations have fared in the past. There will be changes, not radical but continual.

CHAPTER V: SCHOOL PROGRAMS FOR ADULTS

ADULT EDUCATION AS A RESPONSIBILITY OF THE PUBLIC SCHOOLS

Public education functions not only in the interests of young people, but also for the great body of persons whose full-time connection with the schools has ceased but who are desirous of further training. The latter group have passed the age for compulsory school attendance, and are employed or are eligible for employment. They are from 16 to 50 or more years of age; they have accepted responsibilities for work, for self-support, and for family maintenance. Their outlook is that of adulthood.

Because the fundamental justification for public education lies in the development of an enlightened citizenry, the responsibility of the public schools extends indefinitely into the adult field. Provisions for the continued development of every person, of whatever age, who desires and can profit from further education, is a concern of the public schools. There is no normal person who cannot improve himself in some knowledge, appreciation, ability, or attitude, and hence in citizenship qualities, if he or she wills to do so. The school organization provides stimulus and facilities for personal and social growth. Public education admits no restriction, from the viewpoint of its citizenship objective, upon the range of educational service to the community, save only the limitations of the students in the capacity and the will to learn. The schools recognize, however, the practical limitations which are inherent in budget-making and taxation problems, but they find as their service increases in value to the community that school support is the more readily obtained.

A principle of public education which is generally recognized is stated in the following phrasing by a State department of public instruction:

> Every individual is entitled to educational opportunity commensurate with his ability and interests up to the point where

> the law of diminishing returns to society indicates further provision will not be profitable either to the individual or to society.

This principle here set forth recognizes that the public schools exist primarily for the good of society and assumes that to the degree that every individual is helped by the schools to improve his or her personal resources—whether for occupational efficiency, for intellectual development, for intelligent choice at the ballot box, or for recreation—to that extent is society the gainer. Educational facilities available to adults in their free time—evenings, late afternoons, Saturdays—render valuable community service. Mature persons have need of the schools to meet a great variety of educational objectives, corresponding to their individual desires. These desires are analyzed in the succeeding section and the part that industrial arts can contribute to their realization is pointed out.

EDUCATIONAL OBJECTIVES OF ADULTS

The educational objectives of adults whether men or women vary according to individual needs and desires, but, in general, they may be classified under the headings which follow. An individual may be actuated by several of these objectives, which it is possible to realize by enrolling in part-time or evening public-school classes. However, as class time is limited—usually to 4 or 6 hours per week—the objective for each course is usually rather specific. Consequently, he is impelled to select the course which corresponds to his present dominant interest. As one purpose is satisfied he enrolls for another course or activity which meets his next most prominent objective. Evening or other extension schools for adults frequently organize their offerings on the unit basis of 6-week or 12-week courses, each of which meets some particular educational need.

Industrial arts and its associated field of vocational education contribute to the realization of all of the objectives here given. Industrial arts makes for the general develop-

ment of the individual, through work and study in the realm of industry, while vocational education through specific training aids the person to attain proficiency for or in an occupation. Industrial arts objectives tend to merge with those of industrial vocational education for many adults, according to the degree to which the purpose becomes specifically occupational. An examination of provisions for adult education will reveal the contributions that industrial arts can make toward the realization of the implied objectives:

1. *Economic advancement within the present occupation.*—The adult school provides educational opportunities through vocational extension courses for those persons who desire particular training supplementary to their daily employment. It also provides, through as wide an industrial arts program as is feasible, opportunities for those who feel the need of broadening their interests, of increasing their knowledge of industry and economics, and of adjusting their personality and talents to the occupational world.

2. *Training for a new occupation.*—Trade preparatory vocational courses may be offered in free-time classes, if conditions are such that these courses would be truly functional in aiding the student to gain a foothold in the new occupation. At entrance upon employment in the new line, objective (1) becomes dominant with many individuals as they realize the necessity for continued improvement. On the other hand, the persons who feel the need for guidance, for exploration of occupations, or for personality adjustment to industrial conditions, are served by industrial arts facilities, and are the better oriented in planning for a new vocation.

3. *Extension of formal education.*—The adult school may provide facilities by which programs of general education which were interrupted in earlier life may be resumed. High-school diploma courses, or subjects required for satisfaction of college-entrance requirements, are examples of this service. Industrial arts for some persons may enter to

the extent to which it would be a part of some curriculum selection. For others, industrial arts experiences may be the core around which would be built the programs of general development.

4. *Americanization.*—English classes for the foreign-born, and instruction leading to naturalization, are commonly offered by extension schools. Industrial arts should have a large part in Americanization training, because of its unique contributions to the individual's interpretation of American industrial life, and to his adjustment to social conditions in this country.

5. *Association with others in improvement of community conditions.*—Auditorium exercises, choral and instrumental music, motion pictures, group discussions, dramatics, community league work, exemplify this phase of adult education. Industrial arts makes a valuable contribution to the growth of those participating, through its experiences with tools, materials, and construction which are called for by community enterprises.

6. *Conservation of health.*—As examples of such services the schools may provide gymnasium facilities, organize hiking clubs, conduct classes in personal mental and industrial hygiene. Industrial arts is contributory to health for many persons by developing muscular coordination, by supplying pleasurable hand activity, and by developing knowledge and appreciation of industrial conditions as a basis for personal adjustments to them.

7. *Social urge for companionship with persons of similar interests.*—Neighborhood clubs or groups may be sponsored and assisted by the schools, for singing and other musical activities, dancing, games, athletics, debates, and hobby activities. As is discussed at some length in later parts of this section, industrial arts has valuable contributions to make in those social activities which would center in the school shops.

8. *Development of recreational interests.*—The encouragement and promotion of wholesome recreational interests is an important part of the work of the adult school in developing citizenship. Facilities may be provided for the learning or for the exercise of skills and knowledge in a great

variety of avocational activities, limited in range only to the resources which can be made available. The industrial arts shops serve in the stimulation and development of many interests in the field of handicraft.

RECREATIONAL VALUES OF INDUSTRIAL ARTS IN THE ADULT SCHOOL

Industrial arts in evening or part-time classes has been shown to have a bearing upon all of the services which attract adult students to the public schools. Its values for the various objectives have been suggested in the preceding discussions. It has been indicated as calling for different degrees of emphasis, according to the particular reason for the individual's attendance.

Industrial arts is the activity through which many adults will find that they can meet the need for enlargement of their conception of the industrial world, and for better adjustment in personal traits and resources to the demands of an industrial environment. Aside from vocational improvement or retraining, it is the recreational values of industrial arts, however, which are usually the most obvious to adults, and which bring them initially under the influence of the schools. Many of the other values mentioned in this discussion become evident to the students after their introduction to the adult schools on an avocational basis. Such persons ask for industrial arts manipulation, study, and construction for the satisfactions which arise from recreational activity involving the personal creation of articles of beauty and utility. From the point of view of community progress and the development of a school program of continued service for various objectives, the schools find it worth while to give particular recognition to the recreational and hobby interests of their students.

Happy is the man or woman who has a dominant interest—a hobby—for leisure hours, other than his craft or profession. Chess, bridge, golf, reading, the collection of stamps or autographs, gardening, photography, amateur craftsmanship; these are illustrations of the innumerable recreational activities of adults. Hobby work with tools and materials possesses absorbing interest for many persons

whose livelihoods are gained in other pursuits. Men and women alike, whether engaged in busines, nursing, the professions, homemaking, or other occupations, can find pleasure and recreation in their free hours in building model yachts, or making furniture, or fashioning articles of jewelry, or doing minor repair work in their homes. Craftsmanship carries the peculiar joy of creating things. A boat, a table, a toy, a dish or bowl, a ring or bracelet, grows visibly and pleasurably under the hand of the amateur craftsman of either sex. Articles for personal use or for gifts emerge with individuality and pride built into them. The satisfaction of the desire to create that is attained through these experiences makes for the culture of the individual. Good taste is developed, appreciation of beauty and craftsmanship is gained, skills with tools are extended, and knowledge of industrial processes and of the problems of workers is acquired.

It is important to recognize that industrial arts—whether in the full-time school for young people or in the extension school for adults—is not specifically vocational in purpose, although it contributes by providing experiences valuable for exploration and adjustment toward occupational efficiency. Its values lie in the general development of the individual. Specific occupational objectives are served under the companion name of vocational education. It is desirable that students of industrial arts be organized in groups distinct from those set up for definite vocational instruction, in order that the particular objectives of the students be served most effectively. It may occur that an adult in recreational shopwork, for example, will disclose aptitudes in design or construction which he or she would desire to develop into trade skills for entrance into a new vocation. In a school of well-rounded facilities enrollment may be made for specific vocational objectives in another class.

TYPES OF INDUSTRIAL-ARTS ACTIVITIES FOR RECREATIONAL VALUES

Industrial-arts experiences desired by adults for recreational purposes may lie in such varied fields as woodwork, metalwork, electricity, radio, automobile maintenance, the

plastic arts, the graphic arts, ceramics, textiles, costuming, pageantry, puppetry, stagecraft, interior decorating, photography, and jewelry making.

Men and women alike may be interested in any of these handicrafts. The only limits to the variety of school offerings are those of financial and physical resources. Some individuals will desire to learn enough about tools to operate a home workshop; others will want to make decorative articles for use in the home or in the office; still others will ask for instruction in various home repairs. All will find enjoyment for leisure hours.

The specific activities which the adult school may provide in recreational industrial arts, if facilities can be made available, are illustrated, but by no means exhausted, in the following list:

Wood and metal finishing:
Painting, staining, graining, varnishing, spraying.

Construction of articles for the home, church, club:
Furniture, toys, camp outfits, screens, radio sets, baskets, puppet stages, puppets.

Model building for personal or children's use:
Kites, model boats, miniature airplanes.

Leather crafts:
Handbags, purses, cardholders, bookbinding.

Home repairs:
Fixing electrical cords, repairing fixtures and appliances, replacing washers in faucets, cleaning traps, adjusting tank mechanisms, patching holes with plaster, refinishing cement walks, sharpening tools, adjusting motors, locks, or hinges, replacing chair seats, rehanging window shades.

Jewelry craft and art-metal work:
Designing and making rings, brooches, chains, bracelets, trays, plant stands, ornamental containers.

Modeling and carving in soap, clay, or wood:
Images, placques, desk accessories, frames, pottery.

Automobile maintenance:
Lubrication, tire repairs, carburetor adjustment, cleaning, battery servicing, lamp replacement.

Textile craft:

Designing and developing weaves, dyeing, garment making.

Gardening:

Building rustic furniture, making bird baths, bird houses, garden ornaments, trellises, replacing handles on tools.

The content of the school instruction in industrial-arts work of this sort must take into account any legal requirements which may enter into certain of the items of home maintenance. The amateur craftsman must know that electrical installations are subject to official inspection and certification; that only a registered plumber is authorized by law, in some localities, to do certain types of plumbing work; that an extension to the house, or a new garage or shed, requires a legal permit in many communities. He learns through the school to stay within the field of recreational handicraft, his activity is essentially play and avocation rather than production.

METHODS OF INSTRUCTION

Instruction of adults in the industrial arts is of necessity highly individualized. Rarely will two students have identical motives for school attendance, or the same background of knowledge or skill. The teacher is a counselor and guide, rather than a mere instructor. For manipulative activities, he uses chiefly the method of demonstration for individuals or for small groups; for information as to processes and craft theory he points out appropriate reference material. He recognizes that each student feels a specific need, although the needs of the group may be as various as the individuals in the group; he sees to it that each person initiates and develops plans to satisfy his expressed need; he advises and assists each student in performing the operations required in carrying through the problem; and he insists that each individual makes critical appraisal of the results of the work. Time and quantity of output are not usually important factors, but originality and correctness in

design, accuracy in craftsmanship, excellence of finish, and satisfaction of personal pride, are the desired elements of accomplishment.

FINANCING INDUSTRIAL ARTS FOR ADULTS

In recent years school boards in increasing numbers have recognized the values to the community of recreational industrial arts for mature persons, and have opened the school shops for this purpose in evenings or late afternoons or on Saturday mornings. In some cases where the school budgets were temporarily restricted, it was found possible to secure volunteer teachers or leaders pending the time when proper salary recognition could be made for the direction of the group.

The materials used for practice and for project construction are usually paid for by the student. He may be asked to bring to the school shop any supplies he will need, or he may be charged a laboratory fee for reimbursement to the school for material which the requisition procedure of the school system has provided.

Instances have occurred in which a room and equipment have been furnished by private or community enterprise, especially in places where the school shops were for the time inadequate for the needs of the adult group. Sponsorship of the activity and the teacher, however, is properly a function of the public-school authorities, because of the responsibility which public education bears for recognition and support of adult education.

CHAPTER VI: IN HIGHER EDUCATION

A PERSISTENT NEED

Industrial arts is a function of complete living and should not be restricted to the programs of the elementary and secondary schools. The needs and interests of college students, as well as the cumulative effect of courses and experiences suggest that offerings be arranged in higher institutions of all types. Acknowledgment of industrial arts as an essential part of general education leads to its provision at the college level as well as in the elementary school and the high school. Conditions of life which call for its teaching persist in the individual and in society, in ever more urgent form. It may be said that both the necessity for and the effect of strengthened development in this phase of learning is cumulative. Therefore, with repetition admitted, attention is called to a few of the major aims of industrial arts work as presented in preceding chapters. These several aims, and a hundred more, are truly constant. They reflect needs and force arrangements which differ only in kind as new levels of growth are attained. Industrial arts is a function of full life, regardless of age and grade, and despite its common assignment to the earlier levels of our educational system.

Because we believe that each person has a tendency toward manual activity, an impulse to creative expression, and a preference for concrete experiences, we cannot set a time for denial of formal assistance in keeping with these urges. A man or a woman of 20 years, as well as a child of 10, deserves opportunities to develop continuously, through every natural avenue and under informed supervision.

It has been argued that courses in industrial arts have guidance value, in that they aid in the discovery and realization of interests and talents. It has been urged that such

courses have potential effect in the development of worthy qualities such as resourcefulness, perseverance, planned procedure, and self-discipline. These helps continue to be needed by adults as well as by children. The continued services implied are the province and the purpose of education at the college level as well as below it. Therefore, there is no definite time for us to slacken attempts to provide better understanding of the materials and processes of manufacture, of the necessity for skillful work, and of the conditions and problems of industrial employment. People, in their development, never cease to need better interpretation of the physical, artistic, and social environment. They never lose interest in the location of raw materials, their working properties, their methods of fabrication, and their ultimate uses. Appreciation of good products, expert craftsmanship, and functional design should be developed under guidance as long as the need exists and as long as the opportunity is present.

College students should be privileged to experience the joy of creative accomplishment, the exercise of judgment when facing a technical problem, and the learning of lessons of thrift so ably afforded by craft work and productive mechanical activity. We must not restrict these broadening influences to the programs of elementary schools and high schools. They must be permitted to play parts in all instructional situations and in all educational institutions, both public and private, both cultural and vocational. Moreover, we must not confine these offerings to the selected few individuals who promise superior acceptance and high professional use. Some industrial arts courses should be required of all students, for purposes of orientation and for developing fundamental skills and insights. Later, for selected groups, no amount of diversity or intensity can be too extreme if consistent with college purposes. In our attempt to meet student needs and to match their interests, two dangers must be avoided. We must not limit curriculum offerings and we must not set up administrative regu-

lations that are out of accord with universally recognized belief in individual differences. Industrial arts can be made an important factor in meeting the curriculum needs of certain groups in our heterogeneous college enrollments provided the administration of the curriculum is sufficiently liberal to allow freedom in the selection of subjects according to basic individual interests and needs.

OFFERING AND MANAGEMENT

The elementary schools and junior and senior high schools are committed to functions different from those of institutions of higher rank. They have tended, through the years, toward a common practice relative to the areas of subject-matter employed in the meeting of their specific purposes. Likewise, their courses and sequences, their floor spaces and equipments, and their method and management plans have come into closer likeness. It has seemed worth while to effect some measure of standardization of the experiences afforded students at these three earlier levels, and it has appeared to be equally important that these three successive school units should remain somewhat unlike. With the fullest possible recognition of the needs and rights of localities, these three parts of the American program have moved toward a reasonable sameness with no great difficulty.

This fundamental principle of consistence in elementary and secondary education needs applications at the higher levels. Colleges and universities, however, tend to incorporate departments, courses, and services which reflect varied institutional purposes. Through the leadership of field specialists and through the exchange of ideas among administrators and faculties, the work of the colleges becomes more uniform within functional groups. It is not anticipated that the curriculums and plans of all higher institutions will become ultimately identical. They may well be similar, but only when the institutional types and purposes are similar. Each college must make its own decisions as to the departments to be embraced, the places to be assigned them in the organization, the courses to be offered, the entrance requirements and standards to be maintained,

the methods to be employed, and the relationships to be fostered.

Many boys have been denied industrial arts experiences in their early schools, by reason of small enrollments or inflexible diploma patterns, and the door of opportunity must not be closed to them in the colleges. Many young women, likewise, apply for college entrance who have had no previous introduction to manipulative and related work. Some students of both sexes enroll from private and denominational schools which are almost if not quite devoid of the kind of instruction here considered. The needs of the students thus characterized will indicate large and important educational gaps in college programs that must be considered by those having administrative responsibility. These needs vary greatly with students and bring continuing and difficult problems in administration and instruction. Some students desire relief from full academic schedules. Some need wholesome recreation which may lead almost unknowingly into worth-while leisure-time pursuits. Some want better understanding of changes in technology and in consequent employment conditions. Some have aims purely cultural and hope that their new courses may enrich and deepen their major fields of study. Others need to plan, through margins, a better adjustment to a changing world of work. Still others seek professional careers in the applied and fine arts.

All the needs of these various groups of young people are logical and deserving; all of their claims upon the time and assistance of higher institutions are natural and valid. Thus curriculums in the field of industrial arts at the college level should be devised in terms of group intentions and desires. They must not blindly follow the old organization charts nor should they embrace only the old divisions of content subjects. Orientation courses, of both class-room and laboratory type, would seem to be the first need. These broad offerings will provide initial contact and stimulation for many. They will discover the abilities as well as the needs of individual students. More important still, they will bring groups into view whose common deficiencies and desires will answer perplexing questions as to what services the college should extend.

The specific areas of subject-matter, the types of courses to be offered, and the media of instruction most appropriate for college curriculums should not be given here. General acceptance of a pattern, however worthy, should not be assumed or suggested. Too much stress cannot be placed upon the right, as well as the duty, of an institution to canvass the whole world of the arts for elements to fit its program. Shall it offer instruction in pottery, leather work, or painting? Shall it continue the woodwork, metal work, printing, and other subjects offered in the elementary and general high schools? Shall it teach textiles, industrial design, or interior decoration? Shall it present architecture, stage-craft, or freehand sketching? Shall it touch upon the problems of related science and of new machine techniques? Hundreds of such units will rush to mind in mixed array. Likewise, questions of function present themselves. Shall these courses be planned for recreation, for their value in correlation, or for specific vocational use? Shall they serve to promote domestic intelligence, a knowledge of employment problems, or a broadened social vision? Shall the selection of courses be based upon and their organization be patterned with reference to materials, processes, or products? What skills, informations, appreciations, and attitudes are intended to be developed? These questions and a host of others, all related to institutional purposes, cannot be answered here. They must remain subject to the judgment of those conversant with and responsible in specific situations.

Nevertheless, certain considerations may be urged for emphasis in the plans of college administrators and faculties generally. Modern trends would dictate that college and departmental lines not be permitted to act as barriers to meeting student needs or to the integration of content. It may be suggested that the related and informational phases, though extremely important, should not overshadow the manipulative and problem-solving aspects of the subjects. Experience has shown that the extra classroom activities of an institution may be effectively merged with the work of industrial arts. Services to the school, to the community, to the State, as well as to the students themselves, should be recognized as practical goals.

Library materials of good account and varied types are needed to supplement or complement activities connected with shop and laboratory equipment. All nearby agencies and institutions both of an art and of a commercial character, which can contribute to the training in industrial arts, should be utilized to the full. Cooperative arrangements may be effected with off-campus individuals and organizations, especially in that phase of the program dealing strictly with occupational preparation. High standards of accomplishment must be set and maintained, and the grading of students' work must match these standards with unfailing rigidness. All teachers must be not only well-informed and inspiring, but also skillful and artistic. Some industrial arts instruction should be required of all students, while the intensive specialization of a selected few students should be given secondary consideration.

SOME TYPICAL SITUATIONS

It has been repeatedly stated in this chapter that industrial arts offerings should match institutional purposes and that plans should be made for recognizing the needs of different groups within the student body. Like emphasis has been given to the belief that standard programs cannot be provided for all colleges of a given type nor for all similar groups of students within them. The following kinds of schools are typical and they exist in large numbers throughout the country. Equally typical are the groups of students within them. The few situations here considered are intended to illustrate how plans may be made in terms of group needs, without doing violence to any arrangements made upon other bases. Serving groups does not mean neglecting individuals, nor does it mean the upsetting of school or departmental organizations. The statements here made are offered merely as suggestions.

The junior college.—The junior college is usually a 2-year institution which exacts high-school graduation or the equivalent for entrance and which may be either publicly or privately supported. The number of such institutions, organized under local boards of education increased rather rapid-

ly during the period of 1931–1935. The curriculums of such schools should be given all possible breadth. It should not be assumed that all of the students enrolled will complete degree requirements at other and higher institutions. Many of them will need terminal programs 2 years or less in length. Industrial arts work offered in these colleges can serve as:

Cultural courses.—For all persons of full-time enrollment and for interested individuals to elect in the customary way.

Preparatory courses.—For those who will specialize later in such fields as engineering, forestry, art education, and industrial teaching.

Semiprofessional courses.—For those who will immediately enter pursuits requiring less than full college preparation but who will need some special help not obtainable in the high school.

Vocational courses.—For those who desire preparation for trades and like employments but who cannot attend vocational schools because of distance and expense. Cooperative agreements or supervised apprenticeship may be considered college responsibilities in connection with these courses. The same may be said of the semi-professional offerings.

Evening classes for adults should be a regular part of the program in all industrial arts fields. Each institution should serve as a center for the higher types of community activity in support of this work.

The arts college.—As a 4-year institution, usually without special vocational function, the arts college can render important services in raising the level of general scholastic attainment among the people and in developing the highest ideals and practices of living and of social participation. These higher schools find increasing use for departments, divisions, and courses classifiable as industrial arts. Properly organized industrial arts subjects in these institutions can serve as:

Cultural courses.—For all students or as electives to serve in orientation to an increasing realm of worth-while content. Likewise, courses of the lecture rather than the labo-

ratory kind, in amplification of older and more formal subjects. (Example: Art Metal Work, The History of Architecture, Commercial or Industrial Design.)

Related courses.—In which art, science, mathematics, drawing, etc., have close interlocking relationship with work fields, tools, instruments, processes, and materials. (Example: Art and design in costuming, chemistry in medicine, mathematics in mechanical drafting, physics in music.)

Technical courses.—Of advanced type in elective fields, for those who enjoy manipulation, who are developing leisure pursuits, or who may have intentions of earning through productive employment. (Example: Painting, carving, bookbinding, general crafts, interior decoration.)

The teachers college.—In this institution, whose purpose is to prepare those who would serve as teachers or other educational workers in schools and elsewhere, industrial arts certainly should find a place. Whether or not an institution has special vocational departments is not a pertinent question as to the inclusion of industrial arts subjects. In this institution organized subjects in industrial arts can serve as:

Cultural courses.—For all students enrolled, upon the assumption that teachers of any subject and at any grade level will need this fundamental element in a broad education. Advanced courses of cultural kind for election by those who find special interest or who show marked ability in this field.

Special courses.—Designed to meet the needs of those pursuing certain special types of instruction. For example, instruction to qualify for teaching rural schools, elementary grades, subnormal classes, physically handicapped groups, etc. Emphasis should be given in such courses to the content of industrial arts, to manipulative activities, and to acquaintance with the materials and projects likely to be employed in these particular teaching fields.

Special curricula.—For such vocational departments as may be parts of the college program. (For example: Industrial arts education, art education, agricultural education, home economics education, etc.) In the preparation of all such curricula, care should be taken to the end that academic and educational background not be overbalanced by manipu-

lative and professional units representative of the specialty concerned.

In-service courses.—Designed for graduates who may return for summer sessions or who may be aided through extension arrangements. Such courses should be based, in content and method, upon the problems that individual teachers are meeting in their daily work. Attention should be given also to preparation for changed schedules or assignments anticipated by such teachers.

The university.—This institution is a group or an association of colleges, each with a vocational purpose. The aims of such an institution are suggested by the words *culture*, *preparation*, *service*, *leadership*, and *research*. Industrial arts subjects are a logical part of the elementary preparation in most of the fields represented by the university. One college may serve another through providing industrial arts subjects which are of advantage to both. The university may serve the community, the State, or a still larger area by offering formal instruction and through other services, to an extent limited only by the vision and enthusiasm of its faculties. Experimentation and other types of research will be a major function, not only of the instruction offered but also of the institutional services rendered.

There is no call for uniformity of plans and practices among these institutions, but it is important that each one should match its own specific purposes in this curriculum area as in others. There should be recognition not only of individual desires but of the needs of groups of students, identified by common characteristics or by occupational choices. The field should not be considered appropriate only for elective purposes, only for learners of meager academic ability, or only for students of high professional promise in the crafts and related arts. It is a necessary part of the general education of all and is an extensive and exacting realm of study for those of recognized talent.

CHAPTER VII: EXTENSIONS OF THE PROGRAM

BROADENED RESPONSIBILITIES OF TEACHERS

Teachers of industrial-arts work have a responsibility for service beyond that which they have in the regular day school. This is due to the increasing use of the school plant in community service, the guidance duties, the extension service, and the growing desire of the community that the teachers should take part in local activities. This responsibility makes it obligatory upon them to seek and to accept opportunities for service which are expressed in supplemental types of work that tie the school closely to the home and the community. In these days of searching criticism of school costs, community service of this nature has a large value. It leads to greater community support, and this is essential to the normal growth of schools.

Duties outside of the classroom naturally vary with the community and year; they change from year to year and from season to season. Sometimes they overlap school duties, but more frequently they occur after school hours, or during week ends. Many of them are an outgrowth of our newly found leisure, of forced inactivity, of endeavors to spend money wisely, of requests by social agencies for help, of rehabilitation, and of a desire to motivate instruction in the formal classroom. For organization purposes they are segregated here into two classifications, namely, "Extra-day school duties" and "Out-of-school activities."

EXTRA-DAY SCHOOL DUTIES

School clubs.—Among the many types of duties which are expected of industrial-arts teachers, we find responsibility for club organizations. School clubs are now commonly organized for both boys and girls. School authorities, recognizing the very natural gregarious desire of young people, take advantage of this opportunity to reach many pupils. Clubs are a means of extending and supplementing the

exploratory curriculum. Many special departments and courses are organized as the direct result of the contribution made to an educational objective by a school club, the club serving as an entering wedge to the curriculum. This procedure is apparent when clubs are organized to deal with typical child or occupational interests, such as model-airplane construction, arts and crafts, archery, boatbuilding, printing, stagecraft, radio, and novelty work. Scores of other interests are developed with considerable success, leading eventually to the organization of regular classes of the same type. A more complete list follows:

Aircraft.
Antiquarian.
Archery.
Automobile.
Basketry.
Bird house.
Boatbuilders.
Camera.
Collecting.
Craft.
Electricity.
Employment.
Exploratory.
Forestry.
Foundry.
Glider.
Gun.
Industrial.
Inventors.
Jigsaw.
Kite.
Leather.
Machinery.
Masonry.
Mechanics.
Metal.
Model making.
Museum.
Opportunity.
Pewter.
Plumbing.
Pottery.
Press.
Printing.
Radio.
Repair.
Rug.
Sheet metal.
Stagecraft.
Stereopticon.
Taxidermy.
Textile.
Toy making.
Trades.
Tree.
Weaving.
Winders.
Woodworkers.

In schools where there is a rich offering of constructive activities in well-appointed shops or laboratories, clubs are likely to grow out of the laboratory experience. Individual pupils develop special interests which merit further study and experience. As school clubs generally admit pupils from various grade levels, membership should be

restricted to pupils with advanced interest in the activities represented by the club.

AFTERNOON AND EVENING CLASSES FOR MEN AND WOMEN

Girls crave and need experience with the shop tools and materials. Throughout the ages, as pointed out in Chapter I, on Origins and Functions of Industrial Arts, mankind has, until recently, made all commodities which he has used.

The great increase in commercially manufactured products is depriving boys and girls of the opportunity to create and manufacture articles for their own use, and at the same time it is crowding into their lives a vast number of mechanical contrivances and products which must be selected and used with intelligence. Among such articles may be mentioned electrical appliances found in the home, including electric stoves, the radio, the telephone, the vacuum cleaner, and the mechanical instruments and machines, such as sewing machines, typewriters, refrigerators, oil burners and air-conditioning apparatus, and cameras. Certainly industrial arts should provide boys and girls with experiences that will aid them in the use of these manufactured products.

Among the objectives to which industrial arts work can contribute to both boys and girls and men and women may be mentioned:

1. An understanding and appreciation of the products of industry (consumer value).
2. Provision of the manual skills and knowledge necessary for the proper use and care of the products of industry (consumer experience values).
3. An opportunity for creative expression through:
   The proper use of articles:
   - For utility.
   - For beauty.
   - For mechanical efficiency.
4. An understanding and appreciation of industry and its personnel (social values).
5. A point of departure for the study of the arts, crafts, and their related subject-matter (creative experience).

Architecture.—Many of us own houses, others rent them—certainly all of us live in houses. Those who own or hope to own their home are interested in architecture.

Classes in this subject should study house styles and exterior architecture. Floor plans, kitchen, parlor, dining room, bedroom, and bathroom locations should be studied. Good house construction, cost of building, cost of repairs, remodeling plans, floor plans, interior trim and decoration, including staircases, fireplaces, window and door trim, are all important. This also includes the reading of house floor and building plans.

How to select a home is an important and helpful topic. The prospective purchaser wonders how to know a well-built home. Consideration should be given to rafters, studs, foundations, floors, insulation, heating plants, conditioned air, plumbing, placement and type of lighting fixtures, etc.

Automobile course.—The objectives of these courses are to educate the automobile purchaser and user to carry on their activities with a greater understanding and appreciation.

How to buy an automobile is a problem which many of us face. The kind of car which we need, the style which is best suited to our resources, how to finance the purchase, new and used cars, the cost of car operation, how to reduce the running costs, are all elements of how to select and purchase the car. The car owner should know something of the mechanical operation of the car, such as how the transmission gears mesh, the effect of clutch riding, care of tires, how to avoid excessive tire wear, the sound of the motor, how to detect faulty operation, protecting the gas line, changing oil, lubrication, antifreeze solution, heaters, radios, brake adjustments, horns, head-light adjustment, gas mixture and the results obtained, and many other details should be known and understood by all drivers. Rules of the road, laws, licensing, good driving practice, what to do when in an accident, how to drive on ice, wet pavement, mud roads, gravel roads, and smooth pavement are important. The right-of-way, insurance policies, legal rights, and good judgment should also be studied.

Consumer courses (our money's worth).—How do we spend our money? Courses designed to aid the purchaser to know values are very helpful. Such courses cross-section many other adult courses but because of concentrated emphasis are more likely to be effective. Courses of this type should be developed around local interests, when they vary from general interests.

General interests include the selection, purchase, use, care, and repair of products of industry. Inasmuch as most of us live in houses, run cars, use telephones, radios, stoves, furniture, clothes, dishes, carpets, drapes, curtains, and many other things, courses dealing with them would be interesting and very helpful to all of us. The newer things which we need to know something about are: Air conditioning, house insulation, oil burners, automatic heating devices, radios, and refrigeration.

Then there is a need for courses of the type in which cosmetics, handbags, luggage, fountain pens, pencils, clocks, silverware, jewelry, and other personal articles are discussed and studied.

Creative expression classes.—Creative expression through construction is a form of leisure-time activity which is enjoyed by many people. This type of work is chiefly of a shop or laboratory type. Little information beyond demonstrations should be given unless pupils display an interest in studying the historical and developmental phases. Among the types of work which are likely to find the best reception, we find:

Clay modeling, pottery, ceramics work.
Art-metal work.
Ornamental iron work.
Textile design and weaving.
Rug weaving.
Jewelry.
Leather artcraft and tooling.
Furniture building.
Radio.
Bookbinding.
Model boatbuilding.
Model airplane building.

Drafting—Reading drawings.—This includes the ability to read and understand conventional symbols as they are found in the many mechanical drawings which are printed in current magazines, newspapers, advertising literature, and manuals and diagrams which explain how to use and

care for the host of mechanical contrivances which are used in and around the home. Many of our automobile drivers need to study car manuals to learn how they are constructed and how they operate.

Furniture courses.—Two types of courses are needed in this field; i. e., construction and consumer courses.

In the former classes, both men and women enjoy making and repairing furniture. Although the home workshop is taking over this type of work, there are many individuals who wish to learn something about this subject and who wish to make furniture of several types. In some cases, interests are turning toward the construction of metal furniture. This is partially supplanting the wooden furniture. Upholstery is also very popular.

The second type of course is the consumers' course. Here students would study period styles, their effect upon modern furniture design, grades of upholstery, woods used in furniture, wood finishes, and furniture in its setting. Trips to furniture factories and stores should supplement the discussion of furniture construction.

Household mechanics.—Girls and women in their work in the home use as many, if not more, of the mechanical products of industry than the men. Not only do they usually buy them but they also are responsible for their proper use, care, and repair. They should be taught to oil the bearings in machines at proper intervals; they should be taught to hear the unusual noises which mean difficulty; to detect trouble before it becomes serious. Some of the repairs needed are of such a character that a good repairman is needed. Others are so minute and simple that the housewife can attend to them. They should be taught to make these repairs and to care for them in such a manner as to eliminate unnecessary repairs. Repairing of extension cords, replacement of fuses, sharpening of knives, driving nails and screws, painting, varnishing, staining, glueing of broken chairs, end tables, and other furniture, cleaning of traps under sinks, installation of curtain fixtures, cleaning and adjustment of gas burners, and replacement of belts are a few of the things which girls and women need to be able to do around the home.

Still other phases of repair work might well be considered. For many of these troubles repairmen must be secured. To know when to employ a man and where to get competent mechanics is valuable. To understand the suggestions of repairmen is essential. Intelligent and judicious selection of the repair expert makes for satisfactory results.

Landscaping.—This course should be built around the interests and garden activities of the home owners. Gardens should be planned and laid out. The styles and kinds of decorative fences, walks, and furniture should be studied. Where to locate the foundation planting, rock gardens, perennial gardens, annual and perennial gardens; how and where to build the lily pond; how to build the fence or wall—are all essential.

Textiles.—A goodly proportion of our incomes goes for the purchase of textile products. Rugs, clothes, drapes, curtains, wall hangings, upholstery covers, and many other articles are constantly being purchased and used by all of us. There is no other material product of industry which is so constantly used by us day in and day out.

Courses emphasizing the historical culture of mankind in these materials are exceedingly rich. Rugs, hundreds of years old, are sold daily. Hand-made works of art valued at thousands of dollars are cherished by many people.

Girls and women particularly derive great joy and satisfaction from the making of clothes, knit goods, needlework, rugs, and hangings. Much artistry and opportunity for creative craft expression may be found in spinning, dyeing, and weaving of textiles. Printed goods are very popular today and this type of work lends itself to inexpensive and fascinating activity for school and home work.

The selection of silks, woolens, cottons, and rayons in particular, presents problems to us on which we have little data collected. Courses which will aid the consumer in the selection, purchase, use, and care of articles made from these materials are badly needed.

Understanding industry.—Courses designed to provide an understanding of industry would be very helpful in developing for the adult an intelligent appreciation of certain aspects of industry. A course of this type is practical only

in cities where there are many factories. Trips through the various factories shall be preceded and followed by discussion pertaining to their observation. Out of such visits should come an appreciation of working conditions of the various groups of employees, an understanding of the methods of industrial plants, an insight into the conditions causing labor troubles, organization of the personnel, and other features. Obviously, such a course would be informative rather than manipulative. In fact, it might well emphasize the social and industrial phases of industry.

Community service.—Schools having industrial arts shops frequently receive requests for help from social agencies, especially during the Christmas season. Prior to Christmas, many schools do much in repairing toys for distribution to the poor. Such work cannot be made the core of a course, but it does play a part in the manner in which the school ought to be used.

Special classes.—Special classes usually enroll either superior or subnormal pupils. Both of these groups live in houses with furniture, drive or will drive cars, wear clothes, and eat, just as normal pupils do. It follows, therefore, that good use of the pupil's time demands a normal shop experience for both special groups.

The slower groups need special attention and help, and should be given extra time in shop work. The operations and processes taught, the articles made, the problems presented, and the knowledge acquired should be that for the normal child, modified to meet the individual needs. Such a situation leaves little room for special shops provided in many school systems in which they devote most of their time merely to weaving, caning chairs, coping saw work, basketry, and simple furniture.

The small group of fast-moving pupils is segregated less often. To them, industrial arts also offers versatility, rich content, and greater opportunity. As their speed of accomplishment in general subjects correlates very highly with their speed in shop work, they should be given more work of a difficult character, full of problems which challenge the abilities of the best pupils in the group. The attempt to meet individual differences is highly commendable. In-

dustrial arts is of value to such groups of both extremes because of its rich and interesting content, and the motivation which it provides for fuller use of the intellect.

Summer and vacation schools.—Industrial arts courses offered during the summer vacations are always very popular. Some of these summer courses are comparable to those given during the school year and others are not. Those which are similar to the courses of the school year are offered for credit. Examinations and tests are given and credit is allowed upon satisfactory completion of the work. Other schools provide industrial arts courses in the summer school, as recreational and leisure-time activities. This is particularly true in cities, where it seems advisable to attempt to keep the children off the streets. The interesting construction work and educational value of these courses is well demonstrated by the large enrollment in arts and crafts.

On the playground.—Directors of playgrounds also find that provisions for shop work fill a definite need of the boy or girl seeking happiness throughout a long summer. Rain, wind, and the heat of the city streets, drive them to seek shelter. Games and books are not enough. The shop tools are welcomed. Leather, wood, metal, and electrical projects; stage and pageant equipment and properties; and many other types of work are found to be helpful in keeping children off the city streets and happily occupied. It is a social service and an education at the same time.

Home room and study halls.—Industrial arts instructors are a part of the teaching staff and as such are assigned to home room and study hall duties. This is a distinct advantage over the older practice of treating the industrial arts teacher as a special instructor. The opportunity to contact pupils not enrolled in industrial arts courses is a great asset. The informal guidance which an industrial arts teacher can contribute in this manner is very valuable.

Stagecraft.—Dramatics is another phase of school work that enlists the aid of the shop teachers. This need can be admirably met through the organization of stage craft clubs or classes. The range of electrical experience, carpentry, painting, and other types of construction is exceedingly

wide and should not be overlooked in any school where dramatics plays an important part in the school curriculum.

OUT-OF-SCHOOL ACTIVITIES

There are many requests that come to the industrial arts teacher from the community. These, too, tend to strengthen the school in the community and help the community to understand that the school and its staff are vital parts of rural, village, and neighborhood life as the case may be. Here, the industrial arts teacher serves in many capacities as the following instances will show.

Social work.—Churches and social welfare centers frequently need assistance in developing leisure-time classes, craft classes, demonstrations, and in the organization of evening classes for minors or adults. For this work some teachers donate their services while others receive a nominal fee. Usually the industrial arts teacher is well prepared to do this work.

Settlement houses frequently provide shops and craft rooms for neighborhood children and young people. Such activities as woodworking, pottery, weaving, and art metal lend themselves to this kind of activity satisfactorily. The shops provide leisure-time opportunities of a hobby type, presented extensively enough to become almost vocational in character. They may also lead to self-discovery. Unquestionably, they assist some individuals to find outlets for creative expression which can be converted into income.

County fairs.—In the fall of the year, county fairs in the United States are legion. As part of their programs, they usually include school exhibits. Occasionally, a working demonstration is desired, and when this occurs, benches, tools, materials, and pupils have to be moved to the fair grounds. Here the parents and other members of the community have an opportunity to see what their children do, and obtain an insight concerning how school funds are spent. The practical phases of shop work make an appeal to many men. This probably is one of the best ways of convincing taxpayers of the value of industrial arts work. The school booths at any county fair, displaying charts, sec-

tional models of parts of cars, and school shop equipment, are exceedingly interesting exhibits.

Leisure-time activities.—Classes designed to meet the needs of individuals whose time is not completely filled are of two types, namely, those for the unemployed and those for persons whose working schedule is such that it leaves more time than can be easily filled with worth-while activities. Persons engaged in seasonal and periodic work frequently face the problem of how to use their free time. With the rise of unemployment has come a new need. Adults find themselves out of work and with no activity with which to fill their unoccupied time. They are looking for things which they can do to use their time profitably, to prepare them for a different type of work in case the old trade should pass away, or for employment which will enable them to use more effectively the products of industry. Recreation organizations which have developed as a result of forced unemployment are numerous and active, and they need the help which shop teachers can provide.

It has been demonstrated through emergency educational services that there are thousands of workers who are ready to enroll in courses which will teach them to be more proficient in their own trades. Others are interested in courses in which they have not had experience. Many of these people are not conscious of their own abilities until they have been led to see the possibilities of growth and development in new fields. A supervisor in a large city has made the statement that many of the unemployed workers have abilities and skills, acquired through hobby craft or leisure-time activities, which they can convert into vocations. The workers do not see these latent possibilities until they have been pointed out to them by a disinterested, but observant person. Industrial arts teachers are frequently able to assist in this manner.

Emergency teaching centers have been established in some States. While many of the classes have been organized in bookwork subjects, others have been organized in art and industrial arts subjects. The large population centers have been most successful in developing craft and art classes for unemployed adults. However, this work is not impossible

in smaller communities. For example, a group in a mountainous region was organized into small classes for craft workers. The products of these classes were displayed and sold, part of the proceeds going to the members. This project was located in a summer-resort country. Because of this, little difficulty was experienced in disposing of the napkin rings, fireplace screens, trays, bookends, novelty furniture, and many other attractive pieces of hand work. The demand for such articles has become so great in the last few years that several organizations for their production have sprung up in many parts of the country.

The Leisure League of America, Inc., is a recent example of an organization to assist people in making wise use of leisure time. It is chartered under the membership corporation laws of New York State as a nonprofit organization. Its avowed purpose is to discover and suggest interesting things for individuals to do in their leisure time, and it acts as a clearing house for hobby ideas. As an aid to "hobbyists", the League publishes a series of attractive 100-page paper-backed books, some of which deal with arts and crafts, which are obtaining wide distribution and popularity. A bibliography directs the reader to further material. The League also sponsored the widely heralded Hobby Round-up which was held in New York City in the spring of 1935. Many similar organizations, such as Home Workshop Guilds and Community Craft Clubs, have been formed.

Extension classes.—Unemployed adults are often eager to join part-time, evening, apprenticeship classes, cooperative schools, and dull-season classes. Such groups aim to prepare individuals for some form of gainful occupation. As a rule they do not teach entire trades, but offer specialized types of work which are eagerly sought after by the mechanic who finds he needs to keep abreast of new processes and methods coming into his trade.

The school club is often aided by popular magazine publishing houses. Gardens, shops, woodcraft, auto mechanics, art metalwork, radio television, are among the topics treated. Some clubs are even sponsored or stimulated by certain magazines. Manufacturers, too, are glad to help by

furnishing literature which will encourage the use of their tools or supplies. Thus, we find that the people of the country very generally, including manufacturers and publishing houses, are ready to support the movement for more leisure-time work. This being true, the schools must not refuse to do their part in forwarding the work of this great movement.

Apprenticeship classes.—In the small communities the industrial arts teacher is the unofficial representative of industry in the school system. While his primary responsibility is to the school and to education along industrial lines, he also has a duty to perform for adults. Frequently a factory employs many of the local people. Most of them go to it directly from the grades or high school without having had any satisfactory shop training. Public schools can furnish in their regular industrial arts shops a type of work which is very helpful to employees and to employers as well. This work is given in extension or apprenticeship classes in various trades. Such classes are usually taught by someone in the community who is a good factory worker, preferably one of the shop workers. In any event, he should be a man who meets the standards demanded by the local industries and one who is satisfactory to local employers. After a satisfactory teacher has been chosen, classes are recruited from the ranks of the factory workers and the members trained in some particular type of work in which there is a shortage of workers, or where the daily work can be improved by study of some related type. As a rule, the industrial arts teacher is able to organize and supervise the teaching, but he frequently lacks a knowledge of shop technic which makes it impossible for him to do the actual teaching.

Rehabilitation.—This type of educational work is another of the many outside activities frequently required of shop teachers. Usually it is extracurricular in nature, but occasionally it is made a part of the regular school duties.

Aid to organizations.—There are numerous organizations in communities which need the aid of industrial arts teachers and others experienced in industrial arts crafts. Community organizations responsible for the development and presentation of pageants and plays for special celebrations need the

assistance that the industrial arts teacher and his pupils can render in making the work a success. Pupils belonging to industrial arts clubs in the school or groups made up of youth who are interested in industrial arts enterprises find the services that the industrial arts teacher can render of inestimable value. The advice and assistance of persons experienced in industrial arts work are needed by such organizations as the Boy Scouts. Scout troops and commissions need the aid of teachers who are familiar with boys and their standards of workmanship. Persons who are trained and experienced in industrial arts find a foremost place in scout counsels and are in demand as examiners. The Boy Scout Merit Badge booklets contain material which is of value to industrial arts classes and industrial arts clubs in the prosecution of their activities.

Emergency classes in Civilian Conservation Corps camps.—Another type of activity demanding the attention of school authorities today is the emergency C. C. C. camps. Boys of an impressionable age are being received by the camps in large numbers for training. Educational directors who have been appointed to most of the C. C. C. camps need the cooperation of local school authorities who are constantly in touch with the best thought in education and particularly in industrial arts and vocational education. In this work, industrial arts teachers can render a most valuable service.

CHAPTER VIII: PROBLEMS OF ADMINISTRATION AND SUPERVISION

INSTRUCTIONAL ORGANIZATION

Programs vary.—Industrial arts is a comparatively new field of education and in many respects differs materially from the older academic subjects. Because of this difference it is important that its organization, supervision, and administration be given special attention. Industrial arts is also an expanding field in which new problems are constantly being presented. Because of its dynamic nature its development in a school system should be the responsibility of some individual with a sound educational background, a familiarity with modern industrial practices and developments, a philosophy of life broad enough to interpret the present social order, and an ability to present the case of industrial arts whenever the whole educational program is under consideration.

The way in which this obligation is met by administrators will vary with school systems. In a small school system the superintendent may have to rely on his only industrial arts teacher. It is important in such a situation that the teacher employed have a broad outlook in order to achieve desirable results. This one factor is a problem common to many administrators, since so many school units are small. In large cities the responsibility of promoting the industrial arts program is usually centered in a supervisor working directly under the superintendent or one of his assistants. Between these two extremes there are many variations. The point to be emphasized is the importance of recognizing the special needs of industrial arts not only in the matter of the curriculum, but also in the equipment and the building arrangements. In planning new buildings it should be the policy to acquaint the architect with the details of shop needs, so as to avoid those unfortunate and frequent situations where new buildings have been completed without adequate provision for industrial arts.

Industrial arts teacher.—The teacher—a man or a woman—of industrial arts in the elementary school, grades 1 to 6, should be a product of a normal school or teachers college giving adequate instruction in the philosophy and practice of industrial arts work to meet the training needs of teachers in that subject. He should also have a manifest aptitude for the manipulation of tools and materials, and the educational training and experience necessary to enable him to outline a program for these grades. Knowledge and skill in this field are especially important in the situation obtaining in many large schools where a special room for industrial arts can be made available for the upper elementary grades.

The teacher of industrial arts in the junior and senior high school grades meets a situation requiring broad teaching preparation and acceptable skill and knowledge in one or more crafts. Professional training and considerable trade proficiency can be acquired in a teachers college with the supplement of personal contact with industry. For many teachers, however, successful work as a skilled mechanic, together with professional training in education, provides desirable preparation in this field. The latter type of background is especially valuable for the senior high school because of the increasing recognition of the vocational contribution of industrial arts. Teachers of industrial arts should have professional and general qualifications which are fully comparable with those expected of other secondary school teachers. They should have a broad social outlook, be interested in pupils and their problems, be proficient in the use of English, be able to organize instructional material, and have personal interest in all school activities.

Curriculum content.—In previous chapters the matter of curricular content has been given much consideration. In this chapter attention is directed to only a few significant developments. Industrial arts has become a broad educational field concerned with a great variety of materials, tools, machines, and processes, with factors conditioning our

social-economic order, and with personal and social relationships. Because of the social factors involved in industrial arts, correlation with the social studies is important. Such a relation would tend to increase the informational and cultural value of both. It no longer suffices to offer an isolated course in woodwork in our attempt to realize the objectives of industrial arts. In a society based on the greatest development of industrial output the world has ever known, industrial arts should be the medium of interpretation through a wide range of practical experiences which involve, on the part of the learner, both manipulation and understanding.

Articulation.—In any study of articulation industrial arts should be included. So far as the subject-matter is concerned, it is related, on the one hand, to the fine arts on which it is dependent for principles of good design and for appropriateness of material and of finish. On the other hand, it is related to vocational types of shop work which involve techniques of construction and highly specialized workmanship.

Three types of abilities are commonly recognized, namely, the ability to understand and assimilate ideas expressed in abstract form, the ability to manipulate materials and tools effectively, and the social ability to direct and lead other people. Of these three, the manipulative ability is probably most prevalent, especially in a civilization so dominantly industrial as is ours. It follows, therefore, that industrial arts which is based primarily on manipulation should be included throughout the school program. The purpose of good articulation is to make the educational program appropriate at each level and continuous throughout the whole learning period. On this basis we may present a program of industrial arts from the kindergarten through college and even into adult life. Suggestions for organizing a program for various levels is presented in the different chapters.

Time allotment.—There seems to be no uniform practice in determining the time to be allotted to industrial arts.

In the elementary grades the time will depend on the class organization and the type of projects which are being carried on. Some pupils will devote more time to manipulative work than others because of their ability and interest. In junior and senior high schools where subject programs prevail, the time for industrial arts is controlled to some degree by the length of the periods.

For purposes of facilitating the making of the school program, principals often prefer to have all periods the same length. Consequently in many schools, both junior and senior high school shop periods are the same length as academic periods. If periods are less than 60 minutes, industrial arts teachers prefer double periods. Their reason is that from 10 to 15 minutes is required for the distribution and collection of tools and materials, and in addition often as much time for demonstration or discussion. It should be obvious that a period shorter than 60 minutes would be inadequate for actual manipulative work. While the total time varies considerably, an average of from 270 to 450 minutes per week is desirable in junior and senior high schools.

With the tremendous increase in secondary school enrollment, due partly to unemployment, compulsory attendance laws, and other contributing factors, it has become apparent that a large number of pupils cannot profit greatly from abstract studies. The practice of allowing such pupils to devote a larger portion of their time to some form of manipulative activity is growing. In some cases, half or more of the school day is so employed. While some of these pupils are just as incompetent in shopwork as in other subjects, nevertheless, many of them find in industrial arts their most effective means of learning and expression.

Size of classes.—So many factors are involved in determining the size of classes that it is difficult to agree on any specific number. Too frequently the number has been arbitrarily determined to conform with the size of academic classes. A fairer and more reasonable approach is to provide liberally in space and equipment and then through a carefully planned organization, involving what has come to

be known as personnel organization, determine through experience how many pupils can be efficiently instructed. There is much need for experiment and research in this field.

BUILDING AND SHOP ARRANGEMENT

Careful planning needed.—When one considers the extent to which industrial arts has entered the school program the importance of providing adequate, properly located, and properly serviced space becomes paramount. To be sure, industrial arts has frequently been introduced in an empty coal cellar but when properly presented it does not stay there. In planning new or rearranging old buildings, the matter of providing shops and drawing rooms demands the most careful consideration. Because of the equipment required and the necessity for pupils moving about rather than sitting at fixed desks, an old academic classroom is not large enough for a shop. Various shop requirements have been mentioned in previous chapters and it should suffice here to enumerate the following elements which are involved in good shop planning.

Working space.—The working space allowed for each student varies with the size of the shop and class. However, 50 square feet of floor space per pupil is considered a good average provided other physical conditions of the shop are normal.

Assembly space.—Assembly space is essential for many projects built in the school shops. This space will vary with the type of shop and the nature of the products constructed. The space between benches, work tables, and machines is often inadequate and very inconvenient for assembling projects. Sufficient space for this purpose should be provided that will insure safety and efficiency in the work.

Storage space.—Storage space should be provided for (1) general supplies and less frequently used equipment; (2) for articles under construction and in the process of finishing. These facilities will vary with the nature of the work, class size, number of classes, time allotment, etc.

Classroom and seating arrangement.—School shops should be provided with facilities for giving demonstrations, shop

talks, discussions, holding meetings, and other instructional devices. Most shops are found lacking in this respect. Too often when the instructor calls the class or a group together for demonstration or discussion, pupils are found standing, sitting, or clinging to any convenient equipment in the vicinity of the speaker. Demonstration benches, tables, or a speaker's stand with surrounding seats on raised tiers have proved satisfactory in practice.

Toolrooms.—A toolroom centrally located, well lighted, and the tools systematically arranged, with an efficient system for checking tools "in and out" will avoid confusion and add greatly to the efficiency of the program. Some teachers prefer small tool cabinets or panels distributed about the shop in close proximity to the type of work in which they are used.

Lighting.—Whenever possible light should come into a school shop from the north and left and from only one side of the building. Artificial lights should be enclosed in order to prevent glare and to distribute illumination more effectively. The light in the school shop may be improved by painting the ceiling, walls, machinery, and equipment a light gray color. Poor lighting is caused also by dirty walls and ceilings, poor and dirty reflectors, low-voltage light bulbs, improper reflectors, lights improperly spaced, light too close to the ceiling, etc.

Ventilation.—Ventilating and heating a school shop is dependent upon climatic conditions, type and size of building, nature of work in the shop, and the heating and ventilating systems in use. A pupil at work gives off approximately 450 B. t. u. per hour, which, according to varying estimates, necessitates a complete change of air every 5 to 45 minutes. Shop temperatures should be approximately 68° F. Higher temperatures induce sluggishness and are not conducive to good working conditions. In warmer weather, when artificial heating is unnecessary, there can be a constant flow and change of air by opening all windows. Woodworking machinery, forges, gas engines, paint spray booths, etc. should be provided with blowers, fans, and vents to carry away fumes, gases, etc.

Safety.—The average citizen is no doubt cognizant of the fact that a large number of accidents occur daily throughout the United States, but unless the accident is within the circle of his immediate family or friends often little or nothing is done in the way of setting up preventive and remedial measures. The real difficulty lies in the fact that the average individual lacks safety consciousness. The seriousness of the situation may, however, be readily comprehended if one stops to examine the facts. Action is being taken in some States to remedy the existing evils. The problem is so important that it merits the attention not only of the employer and employee but of everyone. Safety is a special problem that should engage the attention of school authorities, as the school is the only social agency that serves everyone.

Any plan for eliminating shop accidents to be effective must be specific. Generalities are insufficient, as general accidents do not occur. Accidents must be anticipated and preventive measures must be devised, as shop accidents are usually caused by ignorance rather than through carelessness. A general statement of warning such as BE CAREFUL or a long list of DON'TS will not suffice.

It has been found that a large proportion of the accidents that occur in school shops are caused by: (1) Faulty construction of buildings, improper placement of machinery, equipment, and materials; (2) the use of improper methods in operating hand tools and power machinery; and (3) disorderly conduct by pupils. No machine is "foolproof." Whenever power-driven machinery is used there is a possibility of injury and accident to the operator. Hence, all power machinery should be amply protected with guards and other necessary devices. Demonstrations and explanations are necessary for the use of all machinery. Safety information by itself is inadequate. The instructor should not only give information about the use and dangers of machines, but should also give opportunity for practice, all of which should culminate in a safety consciousness if the instruction is to be effective. At no time should guards on machines be removed or out of position to avoid use.

Any special machine set-up should be supervised personally by the instructor. All defective machinery should be repaired as soon as possible.

Lockers.—Separate lockers should be provided for each student to care for his equipment and materials. There is nothing more discouraging to a student than to have his materials lost or damaged simply for the lack of a proper place to store them. Metal lockers are preferable, due to their compactness, strength, and fireproof qualities. Wooden lockers, however, can be purchased or constructed more economically and serve the purpose adequately.

Lavatory facilities.—School shops should be provided with adequate lavatory equipment. The facilities should vary depending upon the subject. For example, the work in an auto mechanics shop or foundry produces more dirt and grime than the drawing room or wood shop. Showers are not an extravagance for certain shops. The major issue concerning shop and school lavatories is cleanliness. Students should be required to keep washstands and other equipment clean and orderly. Failure to do so creates a spirit of disrespect for school property.

TYPES OF SHOPS

Variation in school shops.—The evolution and development of the industrial arts program, from the inception of shop work, early known as manual training, to the present time, has been characterized by changes both in terminology and in the types of classrooms, shops, and laboratories developed to house this part of the general educational program. Manipulative work and creative experiences are found today in our public schools on all levels. The nature of these activities and the physical setting required for them vary widely in different schools, school systems, communities, and sections of the country. These differences have been accompanied by a diversity of terms used to designate the types of shop organizations in vogue. The following are those commonly found:

Classroom or activity room.—In the lower elementary grades work with simple tools and such materials as wood, paper, cloth, textile fibers, clay, cement, basketry materials,

is frequently conducted in the classroom either at the pupil's desk or at work tables or benches especially designed and constructed for this purpose.

The integrated shop or activity laboratory.—This is a centrally located shop or laboratory adapted for use of pupils in all the grades of the elementary school for the purpose of working on individual and group projects that cannot be carried forward in the classroom and of constructing articles on a play and hobby level.

The general comprehensive shop.—This shop, usually found on the junior high school level, usually consists of a large single shop room in which a wide variety of manipulative experiences are conducted. The experiences include opportunities for enhancing the pupil's general intelligence and for exploration and try-out in the basic fields of human endeavor, such as woodwork, metalwork, electricity, the graphic arts, the ceramic arts, the textile arts, transportation and communication, and the agricultural arts.

The general unit shop.—A shop in which the experiences are confined to a large field of human endeavor which embraces many occupations that are allied and contain common elements. Example: A general unit shop in woodwork may include the following: (1) bench woodwork, (2) machine woodwork, (3) cabinet making, (4) mill work, (5) carpentry, (6) cement forms, (7) wood turning, (8) wood patternmaking, (9) painting and finishing, (10) weaving, (11) upholstery.

The portable general shop.—This is a type of organization employed by the itinerant shop teacher, especially in rural communities. Basic equipment such as benches, and common supplies and materials, are maintained in each of the school shops, while the major portion of the tools and other necessary equipment is mounted on racks and panels or fitted into tool kits and other suitable and convenient devices for transporting them to the various schools. This method is financially economical and guarantees a maximum of use.

Home mechanics shop.—The educational experiences in the home mechanics shop are grouped around activities essential to the welfare of the home, such as woodwork, elec-

tricity, plumbing and pipe fitting, concrete and cement, metalwork, and numerous "unspecialized practical activities" essential to the upkeep of every household.

The unit shop.—The work in a unit shop is confined to the experiences of a single occupation or activity such as printing, machine shop, mechanical drawing, and pattern making. In organizing such a shop for industrial arts purposes it is to be borne in mind that school shops to be of value must be organized upon a sound educational philosophy and upon valid aims of industrial arts education, from which definite values should accrue. Unfortunately, however, school shops are frequently organized upon administrative expediency, the attempt to duplicate another system or organization, or upon the whims, particular experiences and background of a teacher, supervisor, or director. The type of school shop that is established in a particular school system should be dependent upon the social, economic, occupational, and educational status of the community, and upon the size of the community, the school, and the school system.

EQUIPMENT AND MAINTENANCE OF SHOP

Cost.—Frequently the first question which arises when shop equipment is requested is, "What will be the cost?" This factor is important, especially when funds are limited and school budgets are being carefully scrutinized and cut. There are instances where school systems have purchased elaborate equipment in times of affluence and from which they are not receiving adequate returns, where a clever salesman has oversold a school, and where a school system attempted to compete with a neighboring town or city. Equipment should not be purchased because it is cheap, inexpensive, second-hand, obsolete in industry, or a whim of the teacher. Cost factors should be determined and governed by a thorough analysis of need and use.

Selection.—Frequently shop equipment is selected without due consideration of its ultimate use. It is always well to formulate a set of principles which may act, at least in part, as a tentative guide to the purchase of equipment.

Pertinent questions to be considered will include:

1. What types of work are to be undertaken?
2. Will it meet course-aims, needs, and requirements?
3. Is it adapted to the local situation?
4. What it its probable length of usefulness?
5. Will it aid in improving instruction?
6. Will it save pupil time and effort?
7. Is space available?
8. Is it dangerous for students to use?

Purchase.—Supplies and equipment should be purchased in accordance with a definite plan. In the larger centers and cities supplies are purchased by and through the business manager of the board of education; in the smaller centers, through the teacher, principal, superintendent, department head, or secretary of the school board. In almost every instance, purchases of any size must have the approval of the school board.

Factors to be considered in making purchases include:

1. A legitimate reason for requesting supplies and equipment.
2. A thorough description of the items, including name, size, grade, quantity, and quality.
3. Definite specifications.
4. Personál knowledge regarding materials desired.
5. Desirability of local dealers whenever possible.
6. Desirability of ordering supplies on a yearly basis.
7. Analysis of all needs so far as possible, making an allowance for emergencies.

Arrangement.—Shop equipment, tools, machinery, materials, and supplies should be arranged to facilitate their use to the fullest degree. This involves such factors as:

1. Location of benches, work tables, and machines—their relationship to each other.
2. Working space around benches and machines.
3. Working space for handling materials.
4. Working space for assembling projects.
5. Arrangement and installation of lighting, hearing, and plumbing.
6. Localization of tool and supply rooms and of special equipment.
7. Safety precautions.
8. Facilities for demonstrations, shop talks, and class discussions.
9. Location of lavatories.
10. Locker space.

Installation.—Installing shop equipment requires as much analysis and planning as its selection. One method fre-

quently used is to draw the floor plan to a convenient scale and to cut cardboard, representing equipment occupying floor space, to the same scale. By moving and arranging the cardboards in various locations and positions, a decision can be reached as to the most advantageous placement of the equipment.

In the larger centers, the school district employs regularly a force of mechanics, such as machinists, carpenters, cabinetmakers, millwrights, sheet metal workers, etc. These craftsmen usually install shop equipment, overhaul it, and take care of adjustments, repairs, and replacements. In the small school systems the instructor usually is required to install his own equipment. Frequently, he has had little opportunity to receive such training. Consequently, it is a wise policy for the school to hire someone who is proficient in the installation of machinery or to specify in the contract that the equipment, machinery, etc., is to be installed and will not be accepted until it is satisfactorily set up for use. The recent development of electrically driven portable machinery has solved many problems of installation.

Use.—Equipment in the school shop is strictly for instructional purposes. This should be borne definitely in mind when requisitioning its purchase and assigning its use in the shop. It is to be used and not abused. Pupils should be made to understand that it is public property, purchased at public expense, as a necessary part of their educational training.

Upkeep.—School shops contain much valuable equipment, especially the machinery, for which a definite policy of upkeep and repair should be established. Classes may be organized so that each member has some definite assignment and responsibility that will aid in keeping the equipment in good working condition. These duties may be rotated weekly and consist of such assignments as the following:

1. Clean all machines and equipment after using.
2. Place all equipment and machine attachments in places reserved for them.
3. Examine and check motors, switches, fuse boxes, belts, guards, etc.

4. Fill grease cups, lubricate all machines and movable parts.
5. Recondition broken parts.
6. File, grind, and sharpen equipment whenever necessary to do a good job.
7. Report to the instructor immediately all equipment not functioning properly.
8. Disconnect all machines when being repaired.

The question is frequently asked whether the pupils should repair the shop equipment. The answer can be given in the affirmative, provided they have the ability to do so and provided the repair work has an educational value and does not become routine or interfere too seriously with the program of instruction. Some school administrators take the attitude that a teacher who cannot keep all of his equipment in repair and condition is inefficient. This assumption is incorrect. The instructor's teaching load and other assigned duties may be so heavy that he has little or no time to care properly for his equipment. In addition, the equipment required for teaching a comprehensive program may be so diversified that only a person experienced in the construction of the machine could be proficient in making all the needed repairs. A mutual agreement between the shop teacher and the principal or other administrative officers should be developed relative to a policy for the up-keep of shop equipment.

Replacement policy.—It is important that schools should establish a continuing policy governing replacement of equipment so that each proposal for a new machine to take place of an obsolete or worn-out one will not be subjected to all the questions and consequent delays that may be injected into it on account of a present local financial situation or the personal viewpoint of some official. Schools can benefit by investigating the replacement policies of business and industry. When industry purchases a machine, for example, a lathe, it plans to "write it off the books" in 5, 10, 15, or 20 years. Very few schools, if any, maintain such a policy. Schools buy equipment with the hope that with reasonable care it will last indefinitely. Cognizance should be taken of the fact that school equipment is used largely by immature and untrained students, as compared with industry's equipment which is used by few persons and

by those who possess skill in the operation of it. Consequently, it is advisable that in accordance with their financial ability schools purchase standard makes of equipment that will withstand hard usage, and that at the time of the purchase, an approximate estimate be made as to the length of its use. Any policy involving pressure or coercion in order to secure replacement of equipment should be unnecessary and discouraged.

TEXTBOOKS AND REFERENCE MATERIAL

Values of textual materials.—Shop teachers are not in accord regarding the use and value of textbooks and reference materials. One group contends that it is an essential factor in good instruction. The opposition is of the opinion that it kills pupil interest. They state, as their chief reason, that pupils enjoy and are interested in shop work because books are not involved.

The chief values of a textbook and other collateral material are:

(1) They are working tools.
(2) They provide for a definite scope of work.
(3) Students assume responsibility in connection with them.
(4) Class standards can be maintained more effectively.
(5) Progress and achievement can be measured more effectively.

Types of materials.—There are four major kinds of materials which can aid in shop teaching:

(1) Books and periodicals devoted to the professional literature on the subject.
(2) Trade and advertising literature.
(3) Pamphlets, bulletins, and monographs published by city and State departments of education, the Office of Education, professional educational organizations, and city, State, and Federal Government departments other than educational.
(4) Motion pictures, slides, etc.

Sources of supply.—Among the sources of supply for textbooks and reference materials are the following:

(1) Publishing houses—order by requisition same as for other supplies.
(2) Donations by patrons and commercial and industrial concerns.

(3) Available newspapers, magazines, and other periodical literature.
(4) Trade journals and house organs.
(5) City school departments.
(6) State departments of education.
(7) Educational foundations.
(8) Office of Education.
(9) Research departments and bureaus.
(10) State and Federal Government departments, other than educational, etc.

The shop library.—Every school shop should possess a library room, or have space reserved for shelves or a cabinet for reference materials. With the abundance of material that is free or for which there is only a nominal charge, there is no excuse for a shop teacher not having available a large supply of reference and illustrative materials.

A filing system.—To classify and file reference materials for convenient and efficient use, a filing system is necessary. Shop teachers have an advantage over other teachers in that files of convenient sizes may be constructed in the shop. The aid of the school librarian or anyone versed in library technique should be solicited if assistance is required in cataloging printed materials.

OUTSIDE CONTACTS

Community duties.—Teaching is a profession in which it is an easy matter for an individual to withdraw from public notice. This is due to the fact that teachers, as a whole, deal with young and immature people. By virtue of his position, the teacher should be a leader or at least a participant in public and community affairs. In many respects he should be a salesman. He must sell plans and ideas to his superiors, pupils, patrons, and the public. He should cultivate a pleasing personality and develop the ability to present his work to others in a brief, clear, and concise fashion. When he is invited, as teachers are frequently, to address service clubs, parent-teacher clubs, and other organizations, he should consider it a privilege.

In order to keep informed about modern industry, industrial processes, innovations and developments, the industrial

arts teacher should contact industry frequently and regularly. One of the best methods is summer employment. Reading current literature, trade journals, and magazines is helpful.

The hobby fair.—The hobby fair is an additional opportunity for the shop teacher to contact parents, patrons, and the public. It is an enterprise, often fostered by the shop teacher, in which the pupil displays his proudest possession. Many of the exhibits are constructed in the school shop after regular class hours or at home, but the abilities required for their construction are acquired through instruction in the school shop.

Patrons' night.—Patrons' night furnishes an unusual opportunity for the industrial arts teacher to make valuable contacts with parents and friends of the school. On this night the school is usually in full operation, consequently the visitors are enabled to see the shops and laboratories under actual working conditions. The industrial arts teacher, therefore, is presented with a very desirable situation for making friends with patrons and other laymen, for discussing with them the work he is doing, and for interesting them in his program.

School exhibits.—School shop exhibits are a means of displaying the work and accomplishments of students. If the exhibit is properly planned and organized and the articles arranged in an orderly and systematic fashion it is interesting, educational, and worth while. If the exhibit is the work of the pupils, and it does not interfere too seriously with the regular program, it is one of the best mediums a teacher can use to bring his work to the attention of patrons, school authorities, pupils, and others. The following means for exhibiting work are often used:

1. *The department exhibit—*
   This consists of the work of all the classes in the various shop departments.
2. *Individual shop exhibit—*
   This consists of a display of a single shop, a single class, or a combined exhibit of all the classes in a single shop.
3. *Instructor's exhibit—*
   This is a perpetual exhibit of work recently completed, work previously completed, and work under construction at the present time.

4. *Exhibits in cabinets and show cases—*
   Many modern schools are constructed with cabinets and show cases which contain a perpetual exhibit, the projects being changed frequently.
5. *Exhibits on bulletin boards—*
   Bulletin boards may be used to display pupils' work especially graphic representation.
6. *Exhibits in store windows—*
   Many merchants are willing to cooperate with the shop teacher by permitting him to display pupil projects in his store windows. It is a good method of calling attention to the work of the schools.
7. *Miscellaneous exhibits—*
   In addition to the types and ways of exhibiting school shop projects already mentioned, there are such additional means as State, county, and local fairs, educational conventions, etc.

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